NEW MEXICO
ENVIRONMENT DEPARTMENT

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Memorandum

To: **LaDonna Turner, Site Assessment Manager**
Technical and Enforcement Branch
U.S. Environmental Protection Agency, Region 6

From: **Dana Bahar, Manager, Superfund Oversight Section**
Ground Water Quality Bureau, New Mexico Environment Department

Date: **August 16, 2010**

Subject: **Pre-CERCLIS Screening Assessment of the Johnny M mine (Grants Mining District), McKinley County, New Mexico: Further action under CERCLA recommended**

Site name Johnny M mine **Alternative names** not applicable
Street address not applicable **City** not applicable **State** New Mexico
Zip code not applicable **County** McKinley
Latitude 35.361959 **Longitude** -107.721956 **TRS** T13N, R8W, s. 7 and eastern half of s. 18

Site physical description:
Features currently at the Johnny M minesite ("Site"), as documented during New Mexico Environment Department's ("NMED's") inspection on July 26, 2010, include a metal half-cylindrical overhang (see P1, P2 and P10), at the back of which is a partially-collapsed elevated wooden platform and a locked vault door (see P15). According to the property owner, Harry Lee, the vault now safeguards artifacts that have been collected from the Floyd Lee Ranch. Additionally, the Site includes several concrete pads (see P8, P11 and P16), several subterranean cylindrical metal vaults and vertical pipes—most of which contain pipes (see P14) and some of which are only partially covered with metal plates (see P4 and P5)—and a fenced former substation with 5 presumed former transformer pads (see P7). The Site is located within a steep-sided valley (see P10 and P12) that broadens considerably toward its mouth, opening into the broader valley of San Mateo Creek ("SMC;" see P13). A predominantly straight drainage, in which concrete debris (see P8), pipes, and wires are exposed, trends southeastward in the direction of SMC; this may be the former dewatering ditch/pipe that is discussed below. The floor of the valley is mostly very flat and appears to

have been graded. Two of the concrete pads include large diameter circular features, one of which has a protruding open pipe (see P11); these circular features may be the locations of the former mine shafts, and the protruding pipe may be the location of a ground water monitoring access point that is referenced in NMED documents from the time of Site reclamation. There are abundant pieces of thin wire exposed in the soil around the Site, and one blasting cap was identified by a member of the State inspection team. Additionally there are small amounts of iron and wood debris scattered around the Site (see P6).

The Site is accessed from state highway 605 through the Floyd Lee Ranch via unpaved roads. State personnel did not attempt to drive all the way to the mine site, although this appears to be possible with 4-wheel drive. Another old road leading from the mouth of the valley toward state road 605 now ends at a locked gate at the Floyd Lee Ranch property boundary.

Site identification:
The Site is one of numerous former uranium mines within the Grants Mining District.

Site summary:
Ore in this mine came from the Poison Canyon tongue of the Brushy Basin member, which overlies the main Westwater Canyon member of the Morrison Formation by approximately 25 feet ("ft"), and also from a zone near the top of the Westwater Canyon member. The depth of the ore-bearing horizons was between 1300 and 1400 ft below ground surface (Ref. 1, p. 1). The ore-bearing zone originally was saturated, but did not resaturate once drained, despite being below the water table (Ref. 3, p. 2). Analysis of ground water chemical data indicates that leakage from the overlying Dakota Formation into the Westwater Canyon has occurred at this mine, which is attributed to ore-body dewatering, despite separation of the two formations by a thick shale sequence (Ref. 2). Discharge plan application DP-20 references current discharge of approximately 1 millions gallons per day ("gpd") to two settling ponds and thence to SMC via a one-mile open ditch across Section 18 that was to be replaced by a 12-inch pipe (Ref. 3, p. 3). Each of the ponds was approximately 100 ft by 400 ft by 15 ft deep, and was constructed subgrade between the base of the Gallup formation and the top of the Mancos Shale. The discharge plan was submitted to the New Mexico Environmental Improvement Board prior to March 27, 1978 (Ref. 3, p. 1), and approved on June 16, 1978 for a five-year period by the New Mexico Environmental Improvement Division ("NMEID") Water Pollution Control Section (Ref. 4). Operations also were conducted under Radioactive Materials License NM-RED-MB-00 (Ref. 5). A map accompanying the discharge plan indicates that the pipe was to lead to an arroyo which then flowed to SMC in Section 19 (Ref. 3, p. x). The area to which discharge occurred was covered by 50 to 80 ft of alluvium and underlain by Mancos shale (Ref. 3, p. 3). Extracted ground water was treated prior to discharge to the ponds by the addition of Nalco 8114 coagulant and a solution of 25% $BaCl_2$ by weight (Ref. 6). Subsurface monitoring of the discharge routing above the Mancos Shale was provided by two monitor wells—GW-7 and GW-8; two other monitoring points—MW-1 and MW-2—also provided monitoring of the surface discharge. A total of eight monitoring locations are referenced for the Site in the application (Ref. 3, p. 4).

The mine shaft was sealed with a four-foot thick water ring reinforced concrete plug set between the Dakota and Westwater members, and installation of a 12-inch thick reinforced

concrete plug with a 20-inch diameter capped steel pipe into the portal (Ref. 7 p. 1-2). Additional proposed reclamation activities included debris burial, partial filling of ponds with waste rock and completion with borrow materials, reconstruction of water diversion into the "old arroyo," and undercutting of waste pile toe.

Backfilling of mine stopes with tailings from the Kerr-McGee mill (now the Ambrosia Lake/Rio Algom mill), where the ore from the mine was processed, was begun in 1977 (Ref. 8, p. 56). Two one-acre areas were utilized at each of 2 surface injection locations for temporary storage of the uranium tailings. An estimated total of 286,000 tons of tailings were slurried into the mine at a depth of approximately 1100 to 1300 ft (Ref. 7, p. 1).

Ranchers Exploration and Development filed notice of its intent to cease mining at the Johnny M mine by mid-February, 1982 (Ref. 9), and site reclamation was underway during a site visit later that year (Ref. 10). NMEID sent a letter to Hecla Mining Company on April, 2, 1985 (Ref. 11), which extended the force of Radioactive Materials License NM-RED-MB-15 through amendment, due to persistent elevated exposure levels at both the North and South vent hole area backfill sites.

Ranchers constructed a monitor well into the Westwater Canyon ore horizon through the north vent hole shaft in order to monitor potential water quality impacts from backfilled tailings during resaturation following mining cessation (Ref. 12). A ground water sample collected from the mine on June 19, 1985 indicated that only manganese exceeded then-current NMWQCC standards (Ref. 13). The Nuclear Regulatory Commission ("NRC") sent notice to Hecla Mining Company in 1993 of the termination of source material license SUA-1482 for the Johnny M Mine (Ref. 14).

Approximately 2 million pounds of uranium oxide ("U_3O_8") were produced from the mine, and approximately 1.5 million pounds are estimated to remain (Ref. 1, p. 1).

Targets:
Potential impacts to the alluvial ground water system during site operation may have occurred from ground water discharges from mine workings to settling ponds and the SMC drainage. Some portion of discharged contaminants may adhere to sediments, and propagate episodically downgradient in response to streamflows within the SMC drainage. Current details of alluvial ground water flow are unknown, but are thought to follow general topographic slope (i.e., locally southward from the Site, and generally westward in the direction of surface water flow). Such alluvial ground water impacts may also propagate into underlying bedrock aquifers through stratigraphic, structural, and/or anthropogenic (e.g., leaky wells, mine shafts) interconnections. Additional contaminant mobilization in ore-bearing Westwater Canyon Formation could result from oxygenated ground water influx resulting from progressive basin recharge following cessation of mining activities. Site-originated impacts also may have occurred from wastes remaining on-site.

Wells that are registered with the New Mexico Office of the State Engineer and located within a 4-mile radius of the Site are shown in the table following (Ref. 15).

Distance from Site (miles)	OSE record number	Owner's last name	use	finish date	depth of well (ft)	depth to water (ft)	casing diameter (in.)	yield (gpm)
0 – 0.25	B 00390	FERNANDEZ CO. LTD	IRR	12/31/1974	1800	900	6.63	850.0
0.25 – 0.50	B 01544	JACKSON	DOM	06/14/2003	715	624	5.0	6.0
0.50 – 1.0	B 00848	KERR-MCGEE NUCLEAR CORP.	MIN		0	0		
	B 00848	KERR-MCGEE NUCLEAR CORP.	MIN	05/14/1981	1611	1315	4.5	
	B 00848	KERR-MCGEE NUCLEAR CORP.	MIN		0	0		
	B 00851	KERR-MCGEE NUCLEAR CORP	DEW		0	0		
1.0 – 2.0	B 01084	FERNANDEZ COMPANY	STK	01/01/1963	320	60		
2.0 – 3.0	B 00456	SANDOVAL	STK		0	0		
	B 00557	NEW MEXICO STATE HWY DEPT	PUB		0	0		
	B 00997	MARQUEZ	MUL		0	0		
	B 01104	SANDOVAL	DOM	04/02/1986	303	247	4.0	12.0
	B 01190	MARQUEZ	STK	08/31/1989	390	37		15.0
3.0 – 4.0	SD 00966	PENA	IRR		0	0		
	B 00415	NEW MEXICO E.I.A.	DOM	03/23/1978	32	15	5.0	20.0
	B 00415	NEW MEXICO E.I.A.	DOM	03/23/1978	32	15	5.0	10.0
	B 00415	NEW MEXICO E.I.A.	DOM	08/10/1977	95	72	5.0	2.0
	B 00415	NEW MEXICO E.I.A.	DOM	08/11/1977	90	73	5.0	10.0
	B 00415	NEW MEXICO E.I.A.	DOM	08/12/1977	80	74	5.0	1.0
	B 00544	MARQUEZ	SAN	06/17/1978	68	30	6.63	8.0
	B 00659	GARCIA	DOM	01/18/1979	220	190		15.0
	B 00861	SANDOVAL	DOM		0	0		
	B 01085	FERNANDEZ COMPANY LTD.	IRR		0	0		
	B 01086	FERNANDEZ COMPANY	STK	01/01/1947	210	20		
	B 01115	MARQUEZ	DOM	07/21/1986	478	204	4.0	30.0
	B 01442	FERNANDEZ COMPANY, LTD.	EXP	06/15/2000	620	87	12.75	1010.0
	B 01442	FERNANDEZ COMPANY, LTD.	EXP	05/28/2002	1150	107	8.63	340.0

Distance from Site (miles)	OSE record number	Owner's last name	use	finish date	depth of well (ft)	depth to water (ft)	casing diameter (in.)	yield (gpm)
	B 01636	GARCIA	DOM	05/10/2005	260	80	4.0	5.0
	RG 43456	FERNANDEZ COMPANY	STK	01/01/1935	300	0		
	RG 43457	FERNANDEZ COMPANY	DOM	01/01/1967	320	50		

DOM -- 72-12-1 DOMESTIC ONE HOUSEHOLD
DEW -- DEWATERING WELL
EXP -- EXPLORATION
IRR -- IRRIGATION
MIN -- MINING OR MILLING OR OIL
MON -- MONITORING WELL
MUL -- 72-12-1 MULTIPLE DOMESTIC HOUSEHOLDS
PUB -- 72-12-1 CONSTRUCTION OF PUBLIC WORKS
STK -- 72-12-1 LIVESTOCK WATERING

Site ownership and Potential Responsible Parties
After discovery of the ore body in 1968, Harrison Western Corporation sunk a shaft between 1972 and 1973. The mine was operated by Kop-Ran Development Corporation and Ranchers Exploration and Development between 1976 through 1982. Hecla Mining Company was the successor to Rancher's interests in the Site prior to April 2, 1985 (Ref. 16). The last recorded Site operator was Newmont Mining Company.

The mineral rights were held by the Santa Fe Railroad in 1982 (Ref. 17). Subsequently Newmont Mining Company acquired these mineral rights when sold by Santa Fe Railroad (Ref. 18. The surface is currently owned by Fernandez Company Limited and Floyd Lee Ranch. According to Mr. Lee, new mining claims have been staked on the Site in recent years.

File review:
Files that were reviewed for this assessment are listed below.

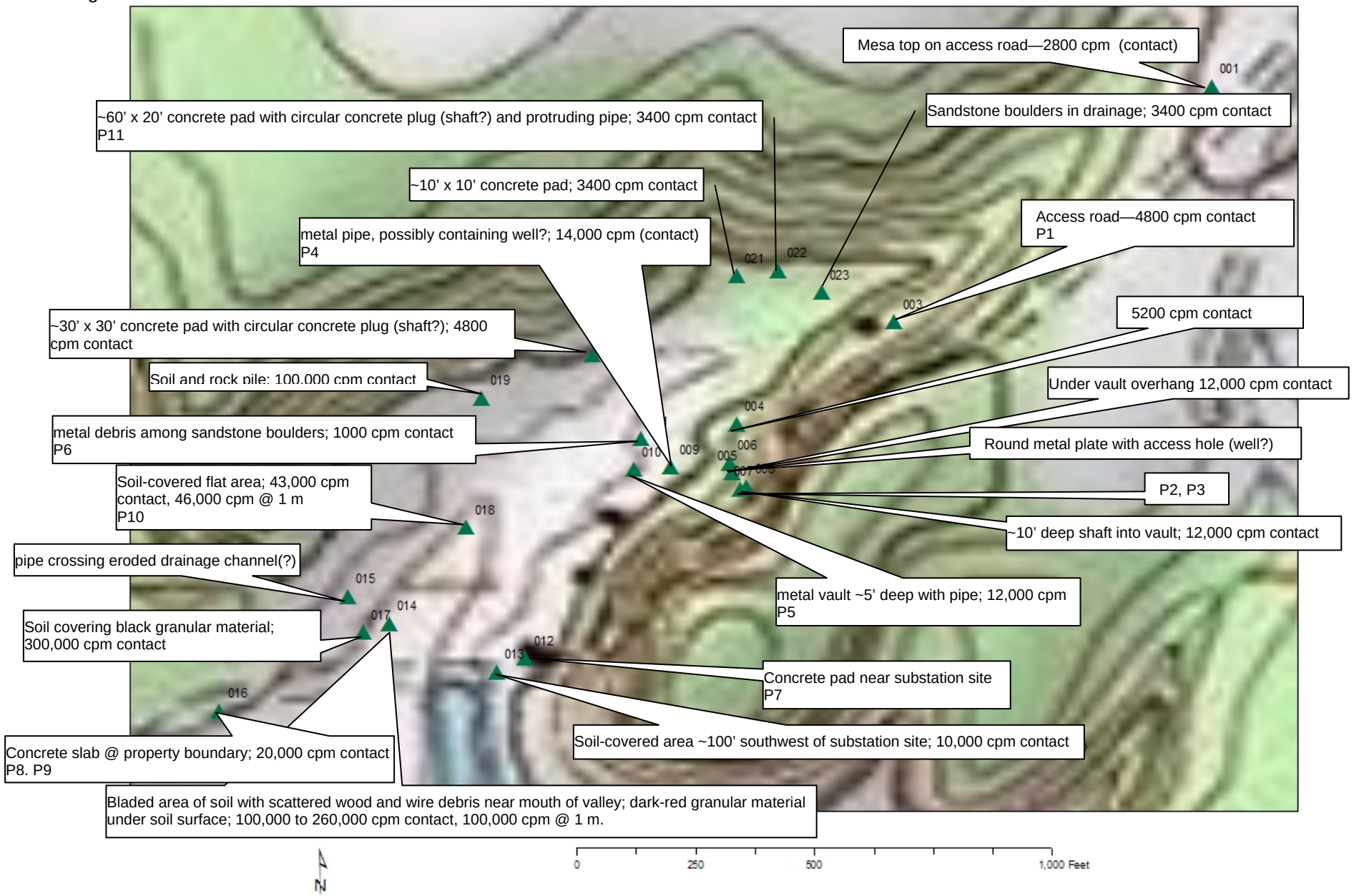
Site reconnaissance:
Personnel from NMED and the New Mexico Energy, Minerals, and Natural Resources Department conducted a Site reconnaissance on July 26, 2010; Mr. Harry Lee accompanied state personnel to the head of valley in which the Site is located. All gamma readings shown on the figure accompanying this report were made with a Ludlum 14-C analog scintillometer (serial number 194209) with an uncollimated Ludlum 44-2 gamma detector (serial number PR241278), for which readings are recorded in counts per minute ("cpm"). Contact readings from this instrument ranged from 2800 cpm on the access road at the head of the valley above the minesite, to 260,000 cpm on the graded area near the mouth of valley. The ground surface at the Site was very wet from heavy rainfall that had occurred during days prior to the Site reconnaissance, and additional rain occurred sporadically throughout the Site visit. According to a representative from Ludlum, such environmental conditions could cause readings from the instrument to be higher than would otherwise occur under dry conditions. Additional elevation of readings also may occur due to radioactivity "shine" caused by topographic conditions or nearby radioactive sources. As further evidence of these potential effects upon the data herein reported, a grab sample of soil from Geographic Positioning Station ("GPS") 14, shown on the accompanying figure, was collected in a ziplock bag, allowed to desiccate for a day, and then another scintillometer reading was taken of the sample. The reading in the field at the location of this sample was 120,000 cpm; the reading from the sample was 12,000 cpm.

During the Site reconnaissance, State personnel also viewed the location of a nearby incomplete mine shaft that originally had been sunk by the Kerr-McGee Corporation on the Floyd Lee Ranch; this shaft has been converted into a water well.

According to Mr. Lee, all possible accesses to ground water in the vicinity of the Site and including those on the Site have been sampled recently by Strathmore Minerals Corporation as part of its baseline data collection for the proposed Roca Honda mine.

Recommendation:
Additional investigation of the Site is recommended to determine if any impacts or conditions exist that would pose threats to human health and the environment, especially the presence of unexploded blasting caps. NMED recommends performance of a radiological Site survey under drier environmental conditions than prevailed at the time of NMED's reconnaissance in order to identify any areas of unacceptably high radiation that may have developed since completion of earlier Site surface reclamation. The area of radiological survey should include the drainage or ditch leading from the Site in order to assess the potential for dispersal of Site-derived waste materials.

Currently, the existence of regional impacts from legacy uranium sites to the ground water system has not been determined. Ground water impacts from "wet" mines such as this Site may have caused contamination to both sediments and the surface water system, which subsequently propagate to the alluvial and underlying bedrock ground water systems. Such impacts to the ground water system may both occur and propagate over widespread areas, and could be difficult to distinguish from impacts from numerous other legacy uranium sites throughout the Grants Mining District. A generalized investigation of ground water impacts from "wet" former uranium mines throughout the Grants Mining District is recommended as part of the overall characterization of ground water quality in the Grants Mining District.



Observations from 07/26/2010 Site reconnaissance of Johnny M minesite

P1: View of vault to southwest from access road

P2: View to west side of valley from above vault overhang

P3: View to east of utilities entering vault below through escarpment

P4: Metal pipe, possibly containing well

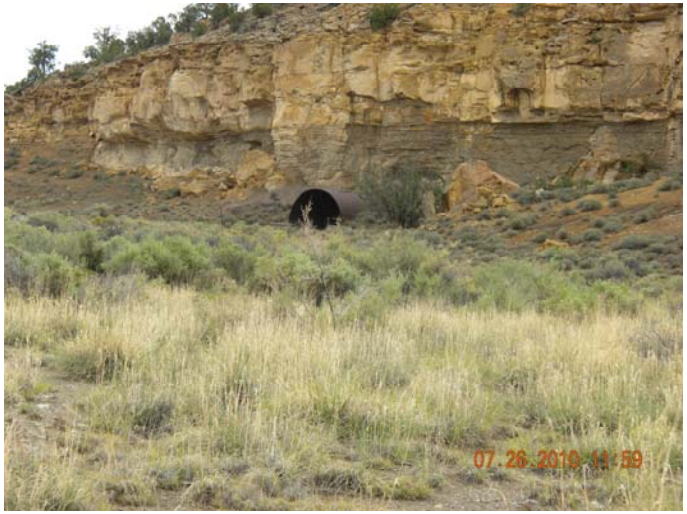
P5: ~5-ft deep vault with piping

P6: Metal debris among sandstone boulders

P7: Former substation location with 5 transformer pads

P8: View to south of concrete slab along drainage

P9: View to north along drainage towards head of valley and minesite



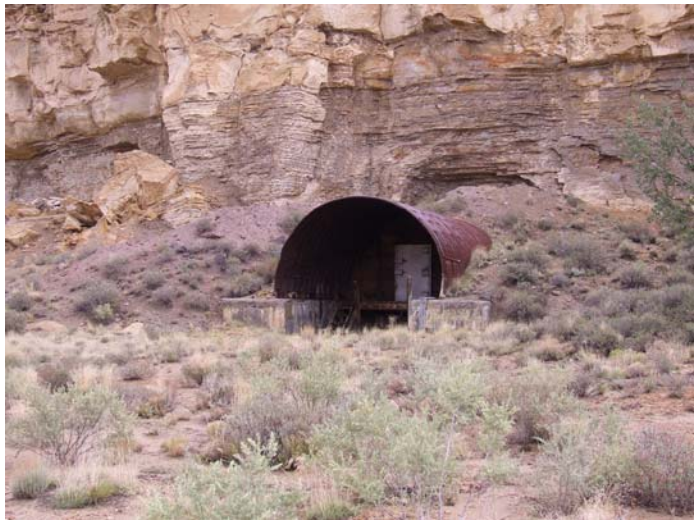
P10: View of vault entrance toward northeast

P11: Concrete pad with circular concrete plug and protruding pipe

P12: View north toward head of valley

P13: View south from mouth of valley toward San Mateo Creek

P14: View into a metal circular vault



P15: View into metal overhang showing platform and vault door

P16: View toward southeast of valley

1. McLemore, Virginia T. and William L. Chenoweth, December 1991 (revised). "Uranium mines and deposits in the Grants district, Cibola and McKinley counties, New Mexico."
2. Kelly, T.E.; Link, Regina; and Schipper, Mark, 1980. "Effects of uranium mining on ground water in Ambrosia Lake area, New Mexico." New Mexico Bureau of Mines and Mineral Resources Memoir 38.
3. Discharge plan for the Johnny M Mine (undated).
4. State of New Mexico Environmental Improvement Division, June 16, 1978. Letter to Ranchers Exploration and Development Corporation).
5. State of New Mexico Environmental Improvement Agency, June 22, 1977. Letter to Ranchers Exploration and Development Corporation).
6. Ranchers Exploration and Development Corporation, undated. "E.I.A." [Environmental Impact Assessment]. Received by New Mexico Environmental Improvement Division on August 20, 1980.
7. Hall, Ramon E. (Director, Uranium recovery field office, Division of radiation safety and safeguards [NRC?], December 21, 1990. "Subject: Termination of the source material license issued to Hecla Mining Company for the Johnny M mine, San Mateo, New Mexico." Memorandum to William Brown (Regional Counsel, Region IV [NRC?].
8. New Mexico Health and Environment Department, July 1980. "Water quality data for discharges from uranium mines and mills in New Mexico."
9. Ranchers Exploration and Development Corporation, January 14, 1982. Letter to New Mexico Environmental Improvement Division.
10. State of New Mexico Environmental Improvement Division, July 19, 1982. Memorandum to file.
11. Miera, Felix R. (NMEID Program Manager, Uranium licensing section), April 2, 1985. Letter to Ms. Colleen Kelley (Environmental Supervisor, Hecla Mining Company). Notice of indefinite extension of Radioactive Material License NM-RED-MB-15 for the Johnny M Mine.
12. Hicks, Randy, September 29, 1982. Letter to Ms. Iona Lee (Lee Ranch)
13. Sares, Steven, (NMED), October 2, 1985. Letter to Colleen D. Kelley (Environmental Supervisor, Hecla Mining Company).
14. Nuclear Regulatory Commission, May 24, 1993. Letter to Hecla Mining Company.
15. New Mexico Office of the State Engineer. "May_06_wells." Shapefile.
16. White, Michael B. (Counsel and Assistant Secretary, Hecla Mining Company), April 18, 1985. Letter to Felix R. Miera, Jr. (Program Manager, Uranium Licensing Section, New Mexico Environmental Improvement Division).
17. Rosel, James M. (Assistant Vice President and Assistant Secretary for Ranchers Exploration and Development Corporation), April 13, 1982. Letter to Randy Hicks (NMEID).
18. New Mexico Energy, Minerals and Natural Resources Department, August 16, 2010. "RE: section 32 mine-MARP Prior Rec files." Emailed edits from Susan Lucas-Kamat (NMEMNRD) to David L. Mayerson (NMED).

Uranium Mines and Deposits in the Grants district, Cibola and McKinley Counties, New Mexico

Virginia T. McLemore
and
William L. Chenoweth

New Mexico Bureau of Mines and Mineral Resources
Open-file Report 353

Revised December 1991

Table 1 - Uranium production 1943–1970 from ore deposits in New Mexico from the U.S. Atomic Energy Commission ore production reports (mill receipts), government contracts only. This includes total ore that was received at the buying stations and mills. Ore grades represent an average of the total shipments V_2O_5 analyses are incomplete; not all of the ore shipments were assayed for V_2O_5. [1]Produced unknown amount of uranium ore after 1970 (see table 2). [2]Some of the ore credited to Barbara J #1 may actually have been produced from Barbara J #3.

Number	Mine Name	Tons Ore	Pounds U_3O_8	%U308	Pounds V_2O_5	%V_2O_5	Type of deposit	Host Rock[4]	Periods of Production/Shipper
				GRANTS URANIUM DISTRICT					
	Cibola County (formerly Valencia County)								
12N.9W.4.414	Blackhawk and Bunney (Sec. 4)	13,934	72,996	0.26	4,571	0.09	limestone	Jt	1952 - John Dorsett; 1954-M.W. Larsen; 1956-Cheyenne Contracting; 1958-1960, 1962-Sutton and Sutton; 1960-1962-Astro Enterprises; 1963-Sutton and Moe; 1965-1966-Mesa Mining Co.; 1967-Bailey and Fife
11N.9W.20.414	Cedar (Yucca, Falcon)	3,199	13,631	0.21	6,461	0.10	limestone	Jt	1952 - Maddox and Teague; 1953-Maddox and Teague; 1954-1955-La Jara Mining Co.; 1955-Falcon Uranium and Oil Co.;1955-1956-Yucca Uranium Co; 1956-1957-Florida Minerals; 1957-Utco Uranium Corp.
10N.3W.22.400	Chaves Lease	192	821	0.21	2,165	0.56	sandstone	Jmr	1955 - Calumet and Hecla
12N.9W.4.243	Christmas Day	2,624	9,373	0.18	5,621	0.10	limestone	Jt	1954-1956 - Colamer Corp.
8N.5W.8.113	Crackpot	3,214	8,396	0.13	21,348	0.33	limestone	Jt	1955 - Anaconda
12N.9W.33.444	[1]F-33 (Sec. 33)	48,686	304,871	0.31	31,306	0.12	limestone	Jt	1954-1959 - Anaconda
11N.5W.26,35	[1]Jackpile-Paguate	9,498,698	46,194,350	0.24	5,315,237	--	sandstone	Jmbj	1952-1970 - Anaconda
12N.9W.15.411	La Jara (Zia)	3,574	31,277	0.44	613	0.52	limestone	Jt,Je	1952 - J.M. Keeney; 1954-La Jara Mining Co.; 1956-Florida Minerals; 1957-1958-Zia Mining Co.; 1960-Chena Mining Co.
12N.9W.8.224	Last Chance	2,753	9,334	0.17	12,804	0.26	limestone	Jt	1951 - William Barlow; 1952-F.A. Sutton; 1953-T.H. Skidmore; 1956-F.J. Broaddus
11N.9W.8.214	Lone Pine	392	983	0.13	3,309	0.42	limestone	Jt	1954-1955 - Lone Pine Mining Co.; 1955-Permian Basin Uranium Co.
8N.6W.16.124	Paisano	9	34	0.18	--	--	limestone	Jt	1957 - Good News Mining Ltd.
12N.9W.4	[1]Red Bluff-Gay Eagle						limestone	Jt	1952-1959 - Uranium Development Co.; 1953,1955,
12N.9W.4.221	Red Bluff #2,4	2,756	10,157	0.18					1957,1964-Moise Mirabel; 1953,1955-1957 - W.A.
12N.9W.4.214	Red Bluff #3,5,9	457	1,350	0.15					Martin; 1954, 1956 - Amuranium Corp; 1954 - M.L.
12N.9W.4.434	Red Bluff #7,8,10;								Larson; 1954 - E and M Mining Co.; 1954 - William
	Gay Eagle	41,914	168,560	0.20					and Russell; 1954, 1956 - McElvain Brothers; 1958-
	TOTAL	45,127	180,067	0.20	49,831				1958 - Sutton and Sutton; 1958 - Chena Uranium Co.; 1959-1960 - L.O. Sutton; 1960 - Astro Enterprises; 1962-1953 - Homer Scriven; 1963, 1965-Mesa Mining Co.
11N.4W.30.243	[1]St. Anthony (M-6, Hanosh)	78,722	320,942	0.20	100		sandstone	Jmbj	1951 - Hanosh Mines; 1957-1960-St. Anthony Uranium Co.; 1960-American Metal-Climax Corp. (now controlled by United Nuclear Corp.)
13N.8W.30.243	[1]San Mateo Mine	837,110	2,847,799	0.17	--		sandstone	Jmp	1959-1962 - Rare Metals Corp. of America; 1962-1967 - El Paso Natural Gas Co.; 1967-1970-United Nuclear Corp.
9N.5W.27.211	Sandy Mine	939	2,221	0.12	2,579	0.14	limestone	Jt,Je	1955 - Anaconda
12N.9W.9.120	Section 9	64,424	189,778	0.15	112,584	--	limestone	Jt	1950 - Fred Glover; 1953-1959-Anaconda; 1960-1962-Farris Mines

Number	Mine Name	Tons Ore	Pounds U_3O_8	%U308	Pounds V_2O_5	$\%V_2O_5$	Type of deposit	Host Rock[4]	Periods of Production/Shipper
14N.10W.14.414	[1]Buckey (Jeep)	161,635	770,893	0.24	241	–	sandstone	Jmw	1957-1958-Holly Minerals; 1958-1965-See Tee Mining Co.
16N.17W.35.411	C D and S	16	48	0.15	–	–	sandstone	Jmw	1957-C D and S Mining Co.
13N.9W.33.433	Charlotte (Section 33)	208	704	0.17	–	–	limestone	Jt	1958-Westvaco Minerals
16N.16W.17.212	[1]Church Rock (Section 17)	77,965	302,608	0.19	–	–	sandstone	Jmw,Jmb, Kd	1960-1961-Phillips Petroleum Co.; 1961-1962-Quinta Corporation (now owned by United Nuclear Corp.)
14N.9W.35.332	[1]Cliffside - Section 36	7,074	6,046,780	0.41	–	–	sandstone	Jmw	1960-1963-Phillips Petroleum Co.; 1963-1968-United Nuclear; 1970-Kerr McGee
13N.9W.20.312	Davenport Incline	7,517	28,539	0.19	–	–	sandstone	Jmp	1957-1958-E.P. Moe; 1959-Black Rock Mining; 1961-See Tee Mining Co.; 1966-Bailey and Fife
15N.17W.33.214	Diamond #2 (Largo #2, Mike Smith Lease)	47,181	202,440	0.21	65,450	–	sandstone	Kd	1952-Albert Smith; 1953-Adee Dodge Enterprises; 1953-1954-General Uranium Co.; 1954-1959-Largo Uranium Co.; 1964-1957- A and B Mining Co.; 1970-Shiprock Ltd.
13N.9W.20.411	[1]Dog, Flea, and BG Group	244,177	906,235	0.19	–	–	sandstone	Jmp	1957-1970-Four Corners Exploration
13N.9W.21.324	[1]Doris-Section 21	31,950	118,052	0.18	–	–	sandstone	Jmp	1958-1959-Westvaco Minerals; 1959-1961-Phillips Petroleum Co.; 1961-KSN Co.
14N.10W.11.312	Dysart #1 (Section 11)	891,922	3,795,495	0.21	47,438	–	sandstone	Jmw	1956-1960-Rio de Oro; 1959-1960-Midcontinent Exploration Co.; 1961-1962-Homestake-Sapin
14N.10W.11.424	Dysart #2	237,602	894,642	0.18	–	–	sandstone	Jmw	1959-1961-Rio de Oro; 1959-Midcontinent Exploration Co.; 1961-1962-Homestake-Sapin
13N.9W.20.233	East Malpais Lease	30,333	139,818	0.23	–	–	sandstone	Jmp	1959-1960-Four Corners Exploration Co.
14N.12W.24.243	Elkins Group	59	151	0.13	231	0.20	limestone	Jt	1953-1954-Josephine Elkins
14N.11W.9.214	[1]Evelyn	10,743	49,584	0.23	23,539	0.48	sandstone	Jmb	1953-1956 - Anaconda Co.; 1966-1968-Farris Mines, Inc.; 1969-1970-Smith Development; 1970-Minerals Energy
13N.9W.29.141	Faith-Section 29	66,327	258,615	0.19	–	–	limestone	Jt	1958-1959 - Westvaco Minerals; 1960-Phillips Petroleum Co.; 1960–1964-KSN Co.; 1963-United Nuclear
13N.9W.30.442	Flat Top	49,663	216,486	0.22	66,126	0.11	limestone	Jt	1955-1957 - Holly Uranium Co.; 1957-1959-Flat Top Mining Co.; 1963-1966-Bailey and Fife
15N.16W.4.111	Foutz #1	324	1,844	0.28	2,676	0.41	sandstone	Jmw	1953-1954-Foutz Mining Co.; 1953-Hanosh Mines, Inc.
15N.16W.31.444	Foutz #2	242	1,045	0.22	2,877	0.59	sandstone	Jmw	1953-1954 - Foutz Mining Co.
16N.16W.31.444	Foutz #3 (Yellow Jacket)	2,412	8,556	0.18	12,466	0.26	sandstone	Jmb	1953-1955 - Foutz Mining Co.
14N.11W.8.213	Francis	755	6,164	0.41	12,578	0.93	sandstone	Jmb	1953-1954 - Farris Mines, Inc.
	[1]Haystack								Haystack Mountain Development Corp.
13N.11W.13.312	SW1/4 sec. 13	1,162	2,830	0.12	–	–	limestone	Jt	1958,1961-Haystack Development Corp.
13N.11W.13.444	Sec. 13	3,736	16,701	0.22	–		limestone	Jt	1956,1958-1961-Art Bibo (mined in trespass)
13N.10W.19.110	Sec. 19 (Haystack No. 1)	137,310	562,267	0.20	165,454		limestone	Jt	1951-A.T.S.F.RR; 1952-1957,1959-1961, 1963-1965-Haystack Mountain Development Corp.
	TOTAL	142,208	581,798	0.20	165,494				
13N.9W.14.414	Hogan Mine (Section 14)	129,551	678,510	0.26	–	–	sandstone	Jmp	1959-1961 - Four Corners Exploration Co.; 1962-Homestake-Sapin

Number	Mine Name	Tons Ore	Pounds U_3O_8	%U308	Pounds V_2O_5	%V_2O_5	Type of deposit	Host Rock[4]	Periods of Production/Shipper
15N.18W.12.244	Hogback #3-5	6,354	24,234	0.19	2,954	0.03	carbonaceous shale	Kd	1952-1954 - Tucker, Hyde, Davenport; 1955-1956-Hyde Uranium Co.; 1957-1958-Calumet and Hecla; 1958-Mathis and Mathis; 1959-See Tee Mining Co.; 1960-Windsor Mining Co.
13N.9W.7.221	[1]Isbella (Section 7)	76,748	237,060	0.15		–	sandstone	Jmp	1959-1961-Phillips Petroleum Co.; 1961-1962-KSN Mining Co.
14N.11W.35.120	Lost Mine	10	4	0.02	4	0.02	sandstone	Jmb	1954-Berryhill and Elkins
15N.14W.12.423	[1]Mac #1	60,109	289,125	0.24		–	sandstone	Jmb	1968-Homestake-Sapin; 1968-1970-United Nuclear-Homestake
15N.13W.18.442	Mac #2	31,194	109,009	0.14			sandstone	Jmb	1968-Homestake-Sapin; 1968-1970-United Nuclear-Homestake
13N.9W.20.144	Malpais Raise	42,070	198,492	0.24			sandstone	Jmp	1958-Holly Minerals; 1958-1961-See Tee Mining Group
13N.9W.23.233	Marquez Mine	712,911	3,724,047	0.26			sandstone	Jmp	1958-1964-Calumet and Hecla; 1965-1966-United Nuclear Corp.
14N.10W.11.112	Mary #1 (Dysart #3)	357,262	794,063	0.11			sandstone	Jmw	1959-1962-Boyles Brothers; 1962-Entrada Corp.; 1964-Stella Dysart; 1964-1965-Homestake-Sapin
13N.9W.20.321	Mesa Top Mine	108,261	512,965	0.24	144,610		sandstone	Jmp	1954-1957-Lea Exploration Co.; 1957-1958-Holly Minerals
13N.10W.4.244	Pat - Junior - Section 4 (Dakota Mine)	5,069	12,645	0.12	2,478		sandstone	Jmw,Kd	1952-1959-Dakota Mining Co.; 1962-1963-Farris Mines, Inc.
13N.9W.19.420	[1]Poison Canyon	217,066	1,004,574	0.23	338,094		sandstone	Jmp	1952-1959-Haystack Mountain Development Corp.; 1960-1962-Farris Mines Inc.
14N.11W.28.113	Red Cap Group (T Group)	195	497	0.13	951	0.24	limestone	Jt	1952-1953-Navajo Development Co.; 1953-Fitzhugh & Doerrie
13N.10W.16.134	Red Point Lode	482	1,223	0.13	746	0.07	limestone	Jt	1952-1955-R.M. Shaw
14N.11W.20.144	Red Top Mines	165	390	0.12	1,287	0.39	limestone	Jt	1955-Red Top Uranium Mining Co.
14N.9W.34.424	[1]Sandstone	1,034,255	3,540,829	0.17	–	–	sandstone	Jmw	1959-1963-Phillips Petroleum Co.; 1963-1970-United Nuclear Corp.
13N.9W.1.200	[1]Section 1 (13N-9W) mined through Cliffside	148,066	1,699,137	0.57	–		sandstone	Jmw	1967,1969-1970-Kerr McGee; 1969-1970-National Lead Co.
15N.16W.3.332	Section 3 (15N-16W) Santa Fe-Christensen (Rats Nest Mine)	324	1,836	0.28	404		carbonaceous sandstone (coal)	Kd	1957-George Christensen; 1957-1958-Rem Uranium Co.
13N.10W.5.144	Section 5 (13N-10W)	23	54	0.12	–		sandstone	Kd	1958-Westvaco
13N.9W.8.114	Section 8 (13N-9W) (Spencer Shaft)	47,808	165,319	0.17			sandstone	Jmp	1958-1960-United Western; 1961-Hyde and Casper; 1964-1966-W.D. Tripp; 1966-1967-James J. Goode
14N.10W.10.244	[1]Section 10 (14N-10W)	130,767	510,935	0.20			sandstone	Jmw	1957-1962-Kermac Nuclear; 1964-Homestake-Sapin
14N.10W.12.411	[1]Section 12 (14N-10)	74,975	211,873	0.14			sandstone	Jmw	1961-Anderson Development Corp.; 1962-1963-Stella Dysart
13N.9W.13.334	Section 13 (13N-9W) SW1/4 (mined through Rialto shaft)	1,689	6,312	0.19			sandstone	Jmp	1962-1963-Febco Mines, Inc.
14N.10W.15.441	[1]Section 15 (14N-10W)	1,213,814	3,625,924	0.15			sandstone	Jmw	1958-1968-Homestake-Sapin; 1961-1965-Rio de Oro; 1968-1970-United Nuclear-Homestake
14N.9W.17.323	[1]Section 17 (14N-9W)	544,164	2,315,182	0.21			sandstone	Jmw	1960-1964-Kermac Nuclear; 1965-1970-Kerr McGee

Number	Mine Name	Tons Ore	Pounds U_3O_8	%U308	Pounds V_2O_5	$\%V_2O_5$	Type of deposit	Host Rock[4]	Periods of Production/Shipper
13N.10W.18.341	Section 18 (13N-10W) (Indian Allotment)	25,796	98,175	0.19	75,342	0.30	limestone	Jt	1952-F.A. Sitton; 1952-Thompson and Williams; 1952-1953-Glen Williams; 1955-1956-Santa Fe Uranium Co.; 1956-1959-Federal Uranium Corp.; 1963-1964-Mesa Mining Co.; 1966-Cibola Mining Co.
14N.9W.18.400	[1]Section 18 (14N-9W) mined through Sec. 17	501,946	1,586,447	0.16			sandstone	Jmw	1962-1964-Kermac Nuclear; 1965-1970-Kerr McGee
14N.9W.20.114	[1]Section 20 (14N.9W) mined through Sec. 17	486,375	2,223,977	0.23			sandstone	Jmw	1962-Kermac Nuclear
14N.10W.22.223	[1]Section 22 (14N-10W) heap leach	2,189,051 —	11,605,672 38,105	0.18 —			sandstone	Jmw	1958-1964-Kermac Nuclear; 1965-1970-Kerr McGee
14N.10W.23.134	[1]Section 23 (14N-10W)	2,528,797	9,679,773	0.19	—	—	sandstone	Jmw	1959-1968-Homestake-Sapin; 1969-1970-Homestake-United Nuclear
13N.10W.23.444	Section 23 (13N-1OW)	21,826	138,541	0.32	10,256	0.06	limestone	Jt	1957-1965-Haystack Mountain Development Corp.; 1965-1966-Santa Fe Pacific
13N.9W.24.121	Section 24 (13N-9W) Chill Wills, Rialto	9,261	31,381	0.17	—	—	sandstone	Jmp	1960-1963-Febco Mines, Inc.
13N.9W.24.300	Section 24 (13N-9W) (Sl/2, East Marquez) mined through Marquez decline	10,120	33,800	0.17			sandstone	Jmp	1960-1962-Calumet and Hecla
13N.11W.24.222	Section 24 (13N-11W) (Nana-A-Bah Vandever Allotment)	24,638	115,075	0.22	85,545	0.18	limestone	Jt	1952-1954-Glen Williams; 1955-1956-Santa Fe Uranium Co.; 1956-1957-Federal Uranium Corp.
14N.10W.24.332	[1]Section 24 (14N-10W)	1,904,582	7,071,564	0.19			sandstone	Jmw	1959-1964-Kerr-McGee Nuclear; 1965-1970-Kerr McGee
	Heap leach	—	579	—					
13N.10W.25.411	[1]Section 25 (13N-10W)	235,156	958,058	0.20	153,657	0.12	limestone	Jt	1951-AT and SFRR; 1955-1961-Haystack Mountain Development Corp.; 1962-1965-Santa Fe Pacific; 1963, 1965-1966-Farris Mines, Inc.; 1968-Homestake Mining Co.; 1969-1970-United Nuclear Corp.
14N.10W.25.144	[1]Section 25 (14N-10W)	1,791,048	6,444,889	0.18	—	—	sandstone	Jmw	1959-1969-Homestake-Sapin; 1969-1970-Homestake-United Nuclear
13N.10W.26.221	[1]Section 26 (13N-IOW) (Desidero Allotment)	11,110	83,752	0.38	17,518	0.08	limestone	Jt	1952-1957-Hanosh Hines
14N.10W.26.220	[1]Section 26 (14N-10W) mined through Section 24	362,110	1,198,696	0.17	—	—	sandstone	Jmw	1965-1970-Kerr-McGee
14N.9W.27.324	[1]Section 27 (14N-9W) mined through	553,732	2,442,855	0.22			sandstone	Jmw	1967-1970-United Nuclear
14N.9W.27.310	Ann Lee	285,057	1,275,695	0.22				Jmw	
	section total	838,789	3,718,550	0.22					
14N.9W.28.333	Section 28 mined through Sec. 30	23,648	94,333	0.20			sandstone	Jmw	1958-United Western
14N.9W.29.300	Section 29 (14N-9W) mined through Sec. 32 shaft	390,511	1,999,236	0.26			sandstone	Jmw	1961-1964-Kermac Nuclear; 1965-1970-Kerr McGee

Table 2—Uranium mines in New Mexico that have produced from 1971 to 1991.

Occurrence number	Mine name	Production[1] class	Host[2] rock	Periods of production/Shipper
		GRANTS URANIUM DISTRICT		
Cibola County (formerly Valencia County)				
12N.9W.33.444	[3]F-33 (Section 33)	c	Jt	1971–1977 - Homestake
11N.5W.26,33	[3]Jackpile-Paguate	e	Jmj	1971–1982 - Anaconda
11N.5W.13.300	JJ #1	d	Jmj	1976–1981 - Sohio-Reserve
13N.8W.24.433	Mt. Taylor	d	Jmw	1980–1983 - Gulf, 1985–1990 - Chevron
12N.9W.4	[3]Red Bluff-Gay Eagle	b	Jt	1976 - Moises-Mirabel
11N.4W.19.300, 11N.4W.30.240, 11N.5W.24.411	[3]St. Anthony	b	Jmj	1976–1980 - United Nuclear
13N.8W.30.243	[3]San Mateo Mine	d	Jmp	1971 - United Nuclear
McKinley County				
14N.9W.28.144	[3]Ann Lee (Spider Rock)	d	Jmw	1971–1972, 1982 - United Nuclear; 1977–1982 - Spider Rock
13N.9W.30.221	[3]Barbara J #3 (White Cap)	c	Jt	1979–1980 - Todilto Exp. Dev. Co.
14N.11W.19.220	[3]Billy the Kid	a	Jt	1976 - Henry Andrews
15N.13W.12.322	[3]Black Jack #1	d	Jmw	1971 - United Nuclear-Homestake
14N.10W.14.414	[3]Buckey	c	Jmw	1972 - Hydro-Nuclear; 1978–1980, 1982 - Cobb
16N.16W.17.212	[3]Church Rock (Sec. 8, 17)	c	Jmw, Jmb, Kd	1976–1977, 1979–1982 - United Nuclear
14N.9W.36.332	[3]Cliffside-Section 36	d	Jmw	1971–1985 - Kerr McGee
13N.9W.20.411	[3]Dog, Flea, and BG Group	c	Jmp	1971–1975 - Four Corners Exp.; 1978–1980 - M&M Mining
13N.9W.21.324	[3]Doris-Section 21	b	Jmp	1978–1979 - Ranchers
14N.11W.9.214	[3]Evelyn	b	Jmb	1971 - Smith Dev.; 1971–1972 - Stevenson; 1972 - Oral Creek
13N.11W.13.314	[3]Haystack-Section 13	c	Jt	1975–1981 - Todilto Exp. and Dev.
13N.10W.19.110	Section 18 and 19	c		
13N.9W.19.323	Hope (Section 19)	b	Jt	1977–1981 - Ranchers
13N.9W.7.221	[3]Isabella	c	Jmp	1978–1980 - Koppin; 1980–United Nuclear
13N.8W.7,18	Johnny M (Sections 7, 18)	d	Jmw	1976–1982 - Ranchers

Number	Mine Name	Tons Ore	Pounds U_3O_8	%U308	Pounds V_2O_5	$\%V_2O_5$	Type of deposit	Host Rock[4]	Periods of Production/Shipper
13N.9W.34.343	Vallejo Mine	6,458	21,733	0.17	394	--	limestone	Jt	1957-1959-Vallejo Uranium Mines;[1]1959-1960-Samson Oil and Minerals; 1962-1963-Penta Mining Co.
15N.16W.2.442	Westwater #1	4,713	26,571	0.28	27,134	0.40	sandstone	Jmw	1957-1960-Westwater Uranium Corp.
	[1]Mine Water Recovery	--	893,787	--	--	--		Jmw	1963-1970-Kerr McGee, HomestakeSapin Partners, United Nuclear

NOTE: In November 1961, Homestake-Sapin Partners acquired Homestake-New Mexico Partners. In April 1962, United Nuclear Corp. merged with the Sabre-Pinon Corp. and United Nuclear became the surviving corporation and became United Nuclear Corp. In February 1963, United Nuclear Corp. acquired the uranium mines and mill of the Phillips Petroleum Co. In 1965, Kermac Nuclear Fuels Corp. was dissolved. The operating company became Kerr-McGee Oil Industries, Inc. Later it was the Kerr-McGee Corp. and the Kerr-McGee Nuclear Corp. In April 1968, Homestake-Sapin Partners became United Nuclear-Homestake Partners. See Chenoweth (1989) for a listing of Ambrosia Lake operations.

Occurrence number	Mine name	Production[1] class	Host[2] rock	Periods of production/Shipper
15N.14W.12.423	[3]Mac #1	c	Jmb	1976–1978, 1980 - United Nuclear-Homestake
15N.14W.12.134	Mariano Lake (Section 12)	d	Jmb	1977–1982 - Gulf
17N.16W.35.200	N.E. Church Rock (2 shafts)	d	Jmw	1972–1982 - United Nuclear
17N.16W.35.200	N.E. Church Rock #1	d	Jmw	1976–1985 - Kerr McGee
17N.16W.36.100	N.E. Church Rock #1-E	d	Jmw	1979–1985 - Kerr McGee
17N.16W.27.200	N.E. Church Rock #2	d	Jmw	1978–1982 - Kerr McGee
13N.9W.30.143	Piedra Trieste (Section 30)	a	Jt	1979–1981 - Todilto Exp. & Dev.
13N.9W.19.420	[3]Poiston Canyon	c	Jmp	1976–1978 - Reserve
15N.13W.21.142	Ruby #1 } mined through	d	Jmb	1976–1979 - Western Nuclear
15N.13W.25.224	Ruby #3 and #4 } same decline			1980–1982 - Western Nuclear
15N.13W.25.224	Ruby #3 and #4	d	Jmb	1980–1982, 1984–1985 - Western Nuclear
14N.9W.34.424	[3]Sandstone	d	Jmw	1974–1980 - United Nuclear
13N.9W.1.200	[3,4]Section 1 (13N–9W) mined through Cliffside	d	Jmw	1971–1982 - Kerr McGee
14N.10W.10.244	[3]Section 10 (14N–10W)	c	Jmw	1980 - Cobb
14N.10W.12.411	[3]Section 12 (14N–10W)	c	Jmw	1978–1982 - Cobb; 1980 - United Nuclear
14N.10W.13.413	Section 13 (14N–10W)	c	Jmw	1977–1981 - United Nuclear-Homestake; 1981 - Homestake
14N.10W.15.441	[3]Section 15 (14N–10W)	d	Jmw	1971–1981 - United Nuclear-Homestake; 1981 - Homestake
13N.9W.16.441	Section 16 (13N–9W) mined through Dog-Flea mines	b	Jmp	1973 - United Nuclear-Homestake
14N.9W.17.323	[3]Section 17 (14N–9W)	d	Jmw	1971–1985 - Kerr McGee
14N.9W.18.420	[3,4]Section 18 (14N–9W) mined through Section 17	d	Jmw	1971–1982 - Kerr McGee
14N.9W.19.411	Section 19 (14N-9W)	d	Jmw	1978–1985 - Kerr McGee
14N.9W.20.114	[3,4]Section 20 (14N–9W) mined through Section 17	d	Jmw	1971–1979 - Kerr McGee
14N.10W.22.223	[3]Section 22 (14N–10W)	d	Jmw	1971–1985 - Kerr McGee
14N.10W.23.134	[3]Section 23 (14N–10W)	d	Jmw	1971–1982 - United Nuclear-Homestake; 1981–1989 - Homestake
16N.17W.23.221	Section 23 (16N–17W)	a	Jmw	1975 - Grace Nuclear (in situ production)
14N.10W.24.332	[3]Section 24 (14N–10W)	d	Jmw	1971–1985 - Kerr McGee

[1]Production Class: a - 0–20,000 lbs U_3O_8; b - 20,000–100,000 lbs U_3O_8; c - 200,000–2 million lbs U_3O_8; d - 2 million-20 million lbs U_3O_8; e - greater than 20 million lbs U_3O_8 (total production to date).

[2]Host rock: Jt - Todilto Limestone; Jmr - Recapture Member; Jmw - Westwater Canyon Member; Jmb - Brushy Basin Member; Jmp - Poison Canyon Sandstone; Jmj - Jackpile Sandstone; Jmj - Jackpile Sandstone; Kd - Dakota Formation.

[3]Produced prior to 1970, included Table 1. Production classification based on total production.

[4]Properties mined through adjacent shafts.

NOTE: In 1981, the United Nuclear-Homestake Partnership was dissolved. Homestake Mining Co. became the sole operator of the mill and the Sections 13, 15, 23, 25, and 32 mines. (All but Section 23 closed in 1981–1982, but Homestake continued to recover uranium from ine water until June 1990.) In 1983, Kerr McGee reorganized the uranium operations in New Mexico into the Quivira Mining Co. Quivira closed its mines in March 1985 but continued to recover uranium from mine water. In 1988, Kerr McGee sold the Quivira Mining Co. to Rio Algom Ltd. Rio Algom Mining Corp. (U.S. subsidiary) continnes to recover uranium from mine water.

EFFECTS OF URANIUM MINING ON GROUND WATER IN AMBROSIA LAKE AREA, NEW MEXICO

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Abstract

The principal ore-bearing zone in the Ambrosia Lake area of the Grants uranium district is the Westwater Canyon Member of the Morrison Formation (Jurassic). This unit is also one of the major artesian aquifers in the region. Significant declines in the potentiometric head within the aquifer have been recorded, although cones of depression do not appear to have spread laterally more than a few miles. Loss of potentiometric head in the Westwater Canyon Member has resulted in the interformational migration of ground water along fault zones from overlying aquifers of Cretaceous age. This migration has produced local deterioration in chemical quality of the ground water.

Introduction

Ground water associated with an ore deposit generally is highly mineralized and has little economic value. This generalization is not true in the Ambrosia Lake area, where the same formation contains high-quality ground water and uranium ore. Commonly, water wells can be found tapping a sandstone aquifer that subsequently is identified as an orebody. Water from these wells may be potable and meet all of the standards set by the Public Health Service. As mining progresses, however, changes in chemical quality of the water occur. These changes are not limited to trace elements but also include some of the major anions and cations. This paper discusses the impact of uranium mining on the principal aquifer in the Ambrosia Lake area, the Westwater Canyon Member of the Morrison Formation.

Uranium ore was first discovered in the Morrison Formation in 1951 and was found near Ambrosia Lake in 1955. Since that time, exploration and mining activities have intensified and expanded. In 1979 about 30 mines were in operation, with the heaviest concentration centered near Ambrosia Lake. Several more mines have been announced in the vicinity of Ambrosia Lake.

With the exception of a few mines that were either dry or under water-table conditions, the mines are excavated in an artesian aquifer with relatively high water-producing capabilities, necessitating dewatering before and during mining operations. As a result, some wells have gone dry. Owing to the low population density and to the depth of the aquifer below land surface, the number of affected wells has not been great.

Geology and aquifer characteristics of study area

The Ambrosia Lake area is underlain by Jurassic and Cretaceous sedimentary deposits dipping to the north and northeast about 2 to 3 degrees (fig. 1). Regional dips have been modified by local structural movements. Normal faulting is typical of the

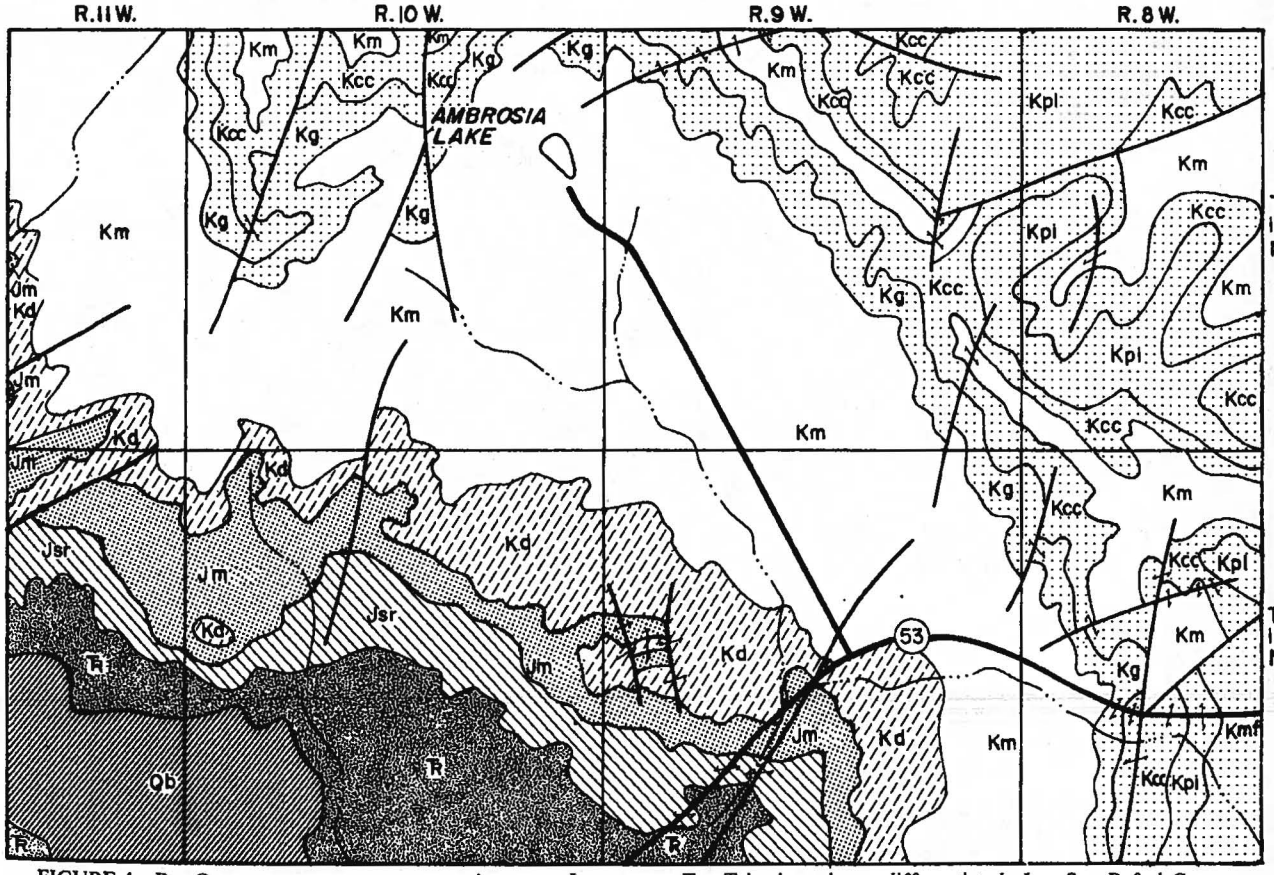


FIGURE 1—PRE-QUATERNARY GEOLOGY IN THE AMBROSIA LAKE AREA: Tr—Triassic rocks, undifferentiated, Jsr—San Rafael Group (Jurassic), Jm—Morrison Formation (Jurassic), Kd—Dakota Sandstone (Cretaceous), Km—Mancos Shale (Cretaceous); Cretaceous Mesaverde Group: Kg—Gallup Sandstone, Kcc—Crevasse Canyon Formation, Kpl—Point Lookout Sandstone, Kmf—Menefee Formation; Qb—Quaternary basalt (figure after Dane and Bachman, 1965).

gallons per day). The average discharge from these two mines plus the United Nuclear-Homestake Partners Secs. 15 and 32 mines was only 0.6 mgd in 1975. Obviously, the discharge from the Secs. 23 and 25 mines has been substantially reduced in spite of an increased mine area. In 1962, during shaft sinking of the Kerr-McGee Secs. 17, 22, 24, 30, and 33 mines, total production was about 1.6 mgd. In 1975, the mill effluent, for which water was produced from these mines after development had taken place, was 1.0 mgd. A similar situation exists for the Kerr-McGee Secs. 35 and 36 mines. Total average discharge was 5.98 mgd in 1975 but only 3.3 mgd in 1978.

Water quality

With the decreased potentiometric head in the Westwater Canyon, leakage from the Dakota Sandstone into the Westwater Canyon probably is induced. Available water-quality data indicate that such leakage has occurred.

Stiff diagrams for water samples from the Westwater Canyon and Dakota show that Westwater Canyon water is essentially a sodium-bicarbonate-sulfate water, whereas the Dakota water is typically a sodium-sulfate water (fig. 7). Water from the Dakota also is higher in calcium and magnesium than the Westwater Canyon water. Concentrations of sodium (plus potassium), chloride, and bicarbonate are approximately equal in the two waters. Sulfate concentration in the Dakota water is approximately twice that in the Westwater Canyon.

Samples were collected in 1979 and compared with earlier analyses from four Ambrosia Lake mines. The 1979 samples are of mine effluent, assumed to be largely or completely from the Westwater Canyon. In each case deterioration of the water quality has occurred (fig. 8). Sodium (plus potassium) and chloride levels have remained relatively unchanged in all four mines. Bicarbonate levels have remained constant in three mines and have decreased in the Johnny M mine. Calcium and/or magnesium levels have increased slightly in all four mines, and sulfate levels have approximately doubled in each case. These changes are most logically explained as leakage from the Dakota Sandstone into the Westwater Canyon aquifer. In each case, the earlier mine samples are similar to the typical Westwater Canyon sample, whereas the later sample is more like the Dakota samples (fig. 9).

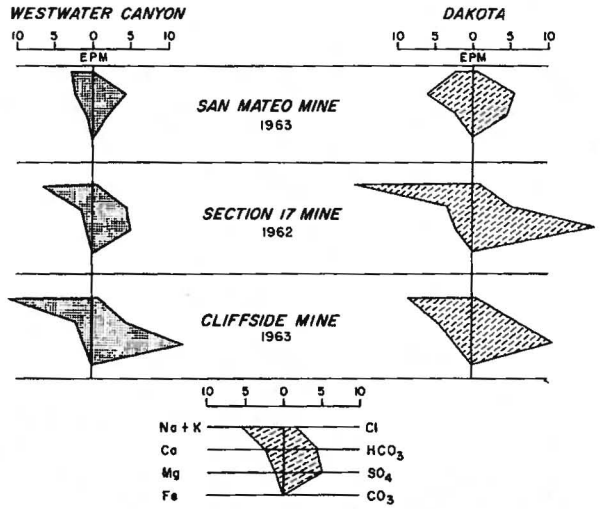


FIGURE 7—STIFF DIAGRAMS SHOWING WATER QUALITY FOR THE WESTWATER CANYON MEMBER AND THE DAKOTA SANDSTONE DURING THE DEVELOPMENT OF THREE MINES; scale is in equivalents per million.

The Westwater Canyon and Dakota aquifers are separated by as much as 150 ft (46 m) of nearly impermeable shale. However, minor faulting has been reported in virtually all of the mines. Although the throw along the fault planes is not great enough in most cases to abut one aquifer against the other, the faults probably do create zones of higher permeability along which leakage occurs. Therefore, after a few years of mining, water production includes a significant amount of leakage from the Dakota as a result of the dewatering of a part of the Westwater Canyon aquifer and the creation of a greater potential for downward migration of Dakota water.

Conclusions

The original hydrologic conditions of the Ambrosia Lake area have been modified by the creation of cones of depression as

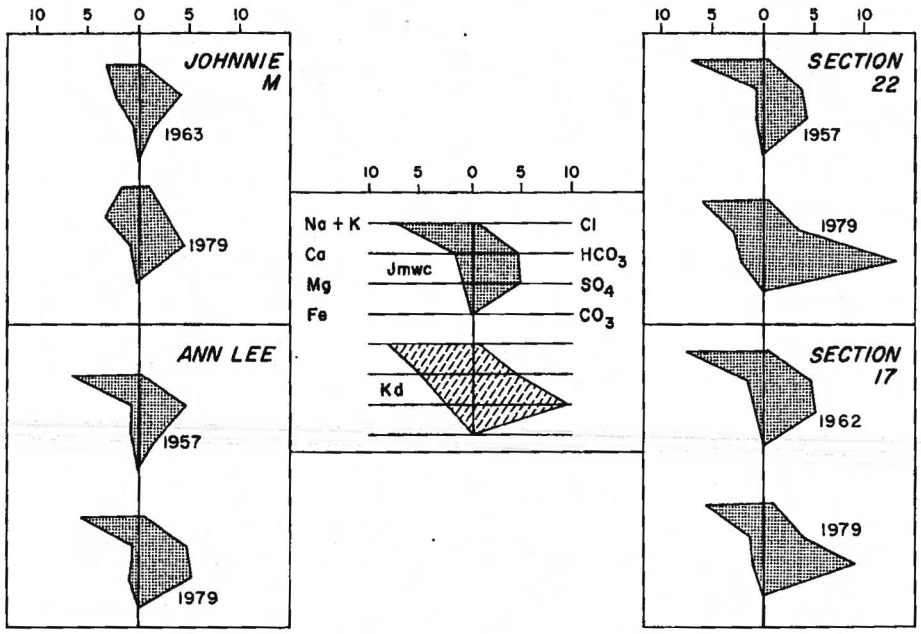


FIGURE 8—STIFF DIAGRAMS COMPARING WATER QUALITY DURING MINE DEVELOPMENT TO 1979 WATER QUALITY, FOR DISCHARGE FROM THE WESTWATER CANYON MEMBER; center: representative samples for the Westwater Canyon Member (Jmwc) and the Dakota Sandstone (Kd); scale is in equivalents per million.

1. INTRODUCTION

By letter dated June 22, 1977 from Mr. Thomas E. Baca, Director of the New Mexico Environmental Improvement Agency ("E.I.A."), Ranchers Exploration and Development Corporation ("Ranchers") was advised that a discharge plan was required for its Johnny M Mine located near San Mateo, New Mexico, pursuant to the New Mexico Water Quality Control Commission Regulations. Specific reference was made to Sections 1-101.I, 3-104 and 3-106 of such regulations. Since the June 22, 1977 letter, Ranchers and the E.I.A. have held numerous discussions and have corresponded with respect to such a discharge plan, and by letter dated February 24, 1978 Mr. Baca of the E.I.A. advised Ranchers that submittal of the required discharge plan would be required on or before March 27, 1978. Ranchers herewith submits its discharge plan for the Johnny M Mine subject expressly to the following:

1. Submittal of the discharge plan is without prejudice to or waiver of Ranchers' rights or position in the pending appeal from the regulations adopted by the New Mexico Water Quality Control Commission (Bokum Resources Corporation et al v. New Mexico Water Quality Control Commission, N. M. Court of Appeals No. 2869), and is further without prejudice to our right to contest otherwise the authority or jurisdiction of the E.I.A. to require such a discharge plan for Johnny M Mine waters.
2. Subject to the matters set forth in paragraph numbered 1 above, submittal of the discharge plan is without prejudice to Ranchers' position that the Johnny M discharge is exempt from Section 3-104 and 3-106 of the regulations by reason of the application of Section 3-105 thereof, including without limitation Section 3-105A thereof.

2. LOCATION AND SITE DESCRIPTION

The Johnny M Mine is located in the Grants Mineral Belt of McKinley County, New Mexico, and presently consists of Section 7 and the East One-half of Section 18, Township 13 North, Range 8 West, N.M.P.M. Figure 1 and Table 1 depict or set forth the age, thickness and lithologic characteristics of those geologic formations in proximity to the host ore sands of the Johnny M Mine.

The host formation for the Johnny M ores is the Morrison formation of Jurassic age. Underlying the Morrison formation is the Bluff sandstone of

Jurassic age, and overlying the Morrison formation is the Dakota sandstone of Cretaceous age. Other important formations at the property not shown on Table 1 are the Mancos shale, which immediately overlies the Dakota Formation (Figure 1) and the Gallup sandstone which overlies the Mancos shale and outcrops near the shaft collar. Both formations are of Cretaceous age.

As shown in Table 1 and Figure 1, the Morrison formation consists of three members in this geographic area. The upper member consists dominantly of green bentonitic shale and is termed the Brushy Basin member. The middle unit contains alternating shale and sandstone beds and is termed the Westwater member. The lower unit consists dominantly of red shales and has been named the Recapture member. Ore at the Johnny M Mine occurs only in sandstone host rock and is limited to two general horizons. The upper host sand is locally termed the Poison Canyon tongue of the Westwater member of the Morrison formation. It occurs in the Brushy Basin shale member about 25 feet above the main Westwater member. The lower ore occurs near the top of the Westwater member.

The host sands were water-saturated when encountered underground but have been drained utilizing drain holes and mine workings. The drain holes ran water for six to ten weeks. Once drained, the sands do not generally produce additional water, which indicates that the sand units are not connected to either vadose or phreatic water sources. As the ore bodies are below the water table and do not recharge, it is apparent that impervious conditions surround the ore sands. With no permeable connection to either meteoric water sources or phreatic water sources, there is no ground water flow through the back-filled stopes; therefore, there will be no flow pattern or rates to determine.

Ranchers does not presently plan to recirculate mine waters through the back-filled material in order to leach uranium from the stopes. Present operations utilize a slurry system to emplace sand into dry open stopes. Once the filling has been completed and the slurry fill-water has drained, no additional water will be directed onto the sandfill.

The transmissivity of rock units above and below the Westwater member (ore host unit) is essentially nil. The Brushy Basin member which overlies the Westwater is composed mostly of greenish-colored mudstones that contain bentonitic clays. When this unit is encountered in mine workings, it is dry. When it is exposed to water, swelling occurs. Due to the swelling characteristic, the Brushy Basin shale tends to self-seal any fracture or drill hole that permits water contact. Sandstone lenses are present within the Brushy Basin member but they are generally encased within the impermeable shale.

The underlying Recapture shale is composed of siltstone and mudstone beds that are also low in permeability. The unit does not normally contain ore, and it has not been encountered in the Johnny M stopes and haulageways.

Neither the Brushy Basin nor the Recapture member can be considered acquifers, since they are essentially dry. They are composed of shales, mudstones and siltstones with negligible or low transmissivity characteristics.

3. CHARACTERISTIC OF DISCHARGE

The quantity and quality of discharge are listed under tabs Discharge Rate Records and Tabs MW 1,2, UG-4,5,6, GW-7,8 and MWS-3 respectively. Location of the above sample points are as follows:

MW-1 At the discharge of the second of two settling ponds.

MW-2 At the discharge of the drainage prior to entry into San Mateo Creek.

UG-4 Underground water from the Morrison formation midway between north and south ore bodies.

UG-5 Underground water from the Morrison formation in the northern ore body.

UG-6 Underground water from the Morrison formation in the southern ore body.

GW-7,8 Monitor wells near mine discharge canal.

MWS-3 Underground water from back-filling slurry mixture drainage.

With respect to the above data, reference should be made to the following maps and figures:

Fig. 2: Johnny M Mine Mine Water Discharge, Location map

Fig. 3: General Detail of mine workings.

Fig. 4: Geologic detail of Monitor wells.

Current mine discharge is ± 1.0 million gallons per day with future discharge potential related to mine development and cessation of operations.

The ultimate discharge course for the mine water, without regard to surface recharge, is from the mine site across Section 18 for approximately one mile through open ditch, most of which is currently being replaced by 12-inch transite pipe, into San Mateo Creek. This area is covered by 50 to 80 feet of alluvial fill and is underlain by the impermeable Mancos shale. Please refer to Figure 2 and Figure 4. San Mateo Creek "flows" in a due west direction for two miles and is also underlain by Mancos shale. It then turns in a southwest direction and flows 8.5 miles underlain by Triassic strata of Wingate sandstone and then joins Bluewater Creek. Bluewater Creek flows in a southeast direction for four miles underlain by Wingate sandstone, where it then joins the Rio San Jose.

The Rio San Jose flows approximately 45 miles easterly into the Rio Puerco. The first 21 miles are underlain by Brushy Basin shale (7 miles), Mancos shale (10 miles) and Wingate sandstone (4 miles), and the remainder is underlain by Bluff sandstone. Please refer to Figure 5 for a detailed stratigraphic section of the above-noted formations.

As used herein, the term"flow" is used to describe the topographic gradient and is not to be construed as an indication or admission that a particular named geographic feature constitutes a normal water course of any kind.

4. DETAILS OF POND LOCATION AND DRAINAGE AREA

There are two retention ponds at the Johnny M Mine (reference Figure 2). The ponds are approximately 100 ft. x 400 ft. x 15 ft. deep. They are constructed sub-grade between the base of the Gallup formation and the top of the Mancos shale formation.

The ponds are protected from natural drainage and excessive surface run-off by topographic features which include major surface drainage areas both to the north and south of the pond area (reference Figures 2 and 6).

Discharge from the ponds is at the extreme west side of the No. 2 pond and is diverted to San Mateo Creek as previously described.

Monitoring in sub-surface strata above the Mancos shale formation in conjunction with discharge routing is provided by monitor wells GW-7, 8 (reference Figures 2 and 4).

5. MONITORING OF DISCHARGE

As pointed out in Section 3, water is monitored at eight locations at the Johnny M Mine; four of these pertain directly to surface discharge: MW-1, MW-2 and monitor wells GW-7 and GW-8.

Grab sample and bailing data for the surface monitoring locations are listed under the specific sample point tabs.

It is the opinion and position of Ranchers, based on the above data, that discharge from the Johnny M Mine meets or exceeds the requirements of current ground water standards as set forth in Section 3-103 of the regulations. Ranchers also proposes that continuing monitoring and water treatment (reference Proposed water treatment tab) would be performed and that data obtained therefrom would be provided to the Director as follows:

1. Two-week sampling, to remain in effect for six months after initiation of $BaCl_2$ treatment in November, 1977.

2. Bi-monthly sampling for one year thereafter.
3. Quarterly sampling for one year thereafter.
4. Semi-annual sampling until the cessation of operation, at which time discharge will be terminated.

During the proposed monitoring program, random spot sample data would be provided to the Director to insure compliance with the discharge plan. Ranchers would also permit authorized representatives of the Director to inspect and sample the discharge facilities, under the supervision of Ranchers, as provided under current Mine Health and Safety Administration requirements.

RADIOCHEMICAL OTHER THAN RADIUM

SAMPLE LOCATION	VANADIUM	THORIUM	LEAD	GROSS	GROSS
(MW-2)	Va	Th_{230}	Pb_{210}	(ALPHA)	(BETA)
DATE	mg/l	mg/l	mg/l	PCi/l	PCi/l
9/30/77	0.1	25.8 ± 0.5	-	300 ± 30	210 ± 10
10/14/77	0.1	39.9 ± 0.1	0 ± 2	211 ± 14	149 ± 6
10/24/77	0.1	4.82 ± 1.82	-	123 ± 20	143 ± 20
11/14/77	< 0.1	3.10 ± 1.76	16 ± 6	354 ± 30	420 ± 29
12/7/77	< 0.1	3.05 ± 1.25	0 ± 2	265 ± 31	136 ± 26
1/6/78	0.1	0 ± .02	0 ± 2	221 ± 51 ?	409 ± 71 ?

GROUND WATER STANDARDS REFERENCE 3-103 SECTION C

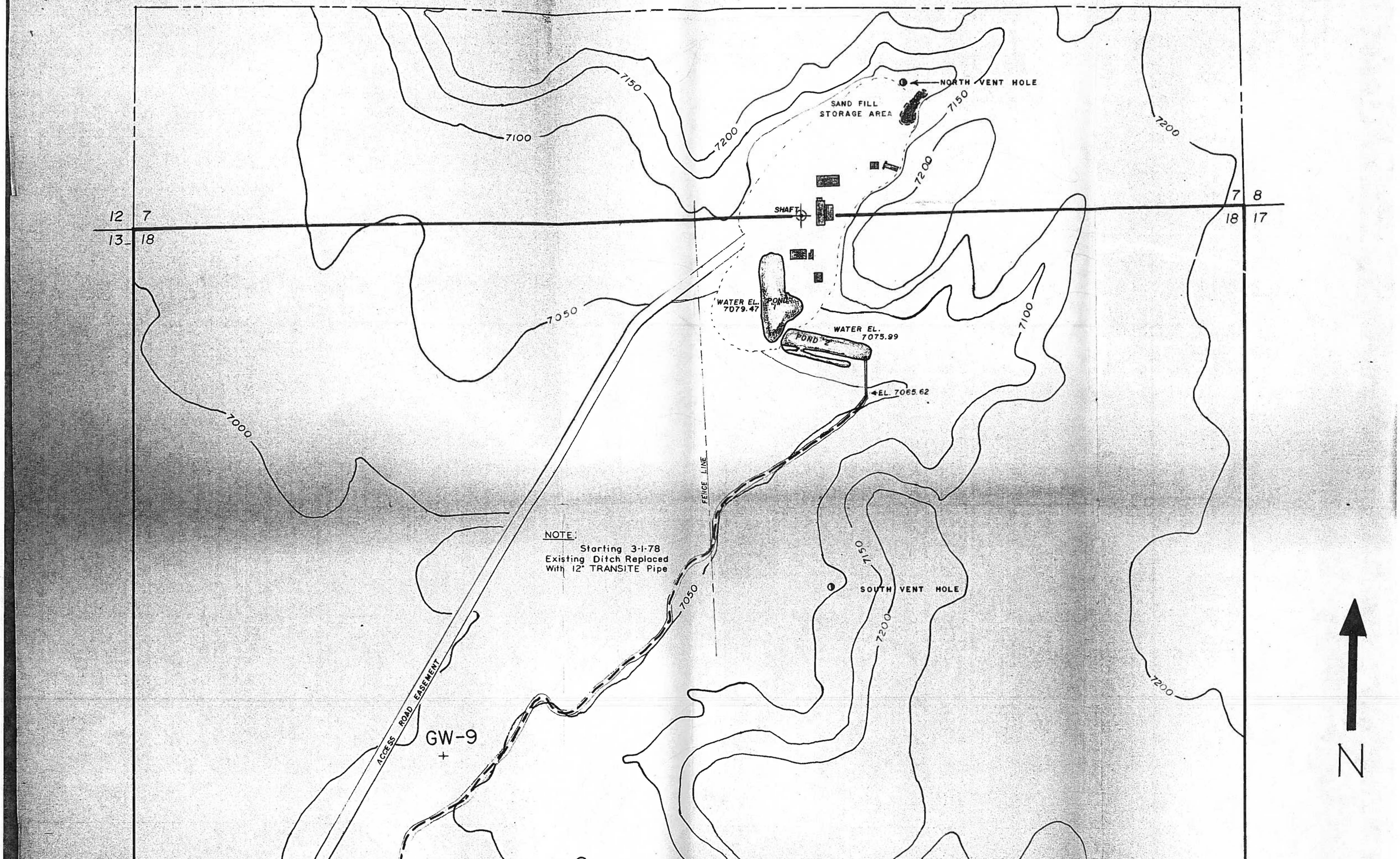
SAMPLE LOCATION	ALUMINUM	BORON	COBALT	MOLBDENUM	NICKEL
(MW-2)	Al	B	Co	Mo	Ni
DATE	mg/l	mg/l	mg/l	mg/l	mg/l
4/15/77	<.1	<.1	<.01	.029	<.01
5/16/77	<.1	<.1	<.01	.008	<.01
6/15/77	<.1	<.1	<.01	.039	.01
9/30/77	-	-	-	<.01	-
10/14/77	-	-	-	<.01	-
10/24/77	-	-	-	<.10	-
11/14/77	-	-	-	.01	-
12/7/77	-	-	-	<.01	-
1/6/78	-	-	-	.10	-

GW-7 EAST MONITOR WELL

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLBDENUM	VANADIUM	RADIUM	THORIUM	LEAD		
(GW-7)	As	Se	TDS	Mo	Va	Ra_{226}	Th_{230}	Pb_{210}	GROSS (ALPHA)	GROSS (BETA)
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
9/30/77	<.01	.01	-	.1	.1	1.21 ± .20	-	-	19 ± 8	55 ± 8
10/14/77	<.01	.01	2030	.1	.1	.47 ± 12	-	50 ± 11	11 ± 4	32 ± 11
10/24/77	<.01	<.01	-	<.1	<.1	.81 ± .20	-	-	85 ± 33	77 ± 19
11/14/77	<.01	<.01	1910	<.1	<.1	2.04±.48	-	-	0 ±5	21 ± 9
12/7/77	<.01	<.01	-	<.1	<.1	.72±.30	-	-	0 ±5	9 ±5
1/6/77	.01	.01	1506	.1	.1	138 ± 6	9.83 ±3.06	15 ±9	678 ±121	608 ±117

GW-8 WEST MONITOR WELL

SAMPLE LOCATION	ARSENIC	SELENIUM	TOTAL DISSOLVED SOLIDS	MOLYBDENUM	VANADIUM	RADIUM	THORIUM	LEAD		
(GW-8)	As	Se	TDS	Mo	Va	Ra_{226}	Th_{230}	Pb_{210}	GROSS (ALPHA)	GROSS (BETA)
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l	PCi/l	PCi/l	PCi/l
9/30/77	<.01	.03	- oops	<.1	<.1	2.61 ± .31	-	-	0 ±2.5	22 ± 7
10/14/77	<.01	.04	23722	<.1	<.1	.13 ± .09	-	-	0 ± 4	4 ± 2
10/24/77	<.01	.04	-	<.1	<.1	2.27± .36	-	-	71 ±34	104 ±34
11/14/77	<.01	<.01	16600	<.1	<.1	3.53± .54	1.83 ± .89	-	108 ±30	212 ±31
12/7/77	<.01	<.01	-	<.1	<.1	3.33± .49	-	-	0 ±26	0 ±30
1/6/78	.01	.01	17500	.1	.1	2.93±.43	-	-	0 ±29	0 ±33


NORTH VENT HOLE
SAND FILL
STORAGE AREA
SHAFT
WATER EL. POND 1
7079.47
POND 1
WATER EL.
7075.99
POND 2
EL. 7065.62
FENCE LINE
SOUTH VENT HOLE
ACCESS ROAD EASEMENT
GW-9
NOTE:
Starting 3-1-78
Existing Ditch Replaced
With 12" TRANSITE Pipe
7100
7150
7200
7050
7000
12 7
13 18
7 8
18 17
N

N

TRANSITE PIPE

7150

7100

7050

MW-1

EL. 7037.81

FENCE LINE

7000

7100

6950

TRANSITE PIPE

GW-8A

GATE

7150

13 18
24 19

18 17
19 20

MONITORING HOLES

GW-7

EL. 6980.83

ARROYO

7050

7000

53

6950

EL. 6931.83

SAN MATEO CREEK

GROUND WATER STANDARDS REFERENCE 3-103 SECTION B

SAMPLE LOCATION	CHLORIDE	COPPER	IRON	MANGANESE	PHENOLES	SULFATE	TOTAL DISSOLVED SOLIDS	ZINC	
(MW-1)	Cl	Cu	Fe	Mn		So_4	TDS	Zn	PH
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
9/15/75	16.2	.577	.48	.043	<.001	96.0	468	.517	8.03
10/20/75	-	-	-	-	-	-	709	-	-
12/29/75	-	-	-	-	-	-	491	-	-
1/15/76	-	-	-	-	-	-	536	-	-
2/11/76	7.2	<.001	.12	.022	<.001	205.0	511	.016	-
6/2/76	-	-	-	-	-	-	545	-	-
9/29/76	-	-	-	-	-	-	737	-	-
11/3/76	-	-	-	-	-	-	541	-	-
3/16/77	-	-	-	-	-	- (MW-2)	571 (MW-2)	-	-
4/15/77	7.6	.004	<.001	.011	<.001	200.0 219	460 548	<.01	7.7
5/16/77	7.5	.011	.005	.008	<.001	202.0 1431	503 2520	.007	8.19
6/15/77	8.7	.001	.016	.013	<.001	202.0 191	5.15 522	<.01	7.94
10/14/77	-	-	-	-	-	-	504.	-	-
11/14/77	-	-	-	-	-	-	528	-	-
1/6/78	-	-	-	-	-	-	526	-	-

GROUND WATER STANDARDS REFERENCE 3-103 SECTION A

SAMPLE LOCATION	ARSENIC	BARIUM	CADMIUM	CHROMIUM	CYANIDE	FLUORIDE	LEAD	MERCURY	NITRATE	SELENIUM	SILVER	URANIUM	RADIUM (STD: 30 pCi/l)	
(MW-1)	As	Ba	Cd	Cr	CN	F	Pb	Hg	NO_3/N	Se	Ag	U	Ra_{226}	Ra_{228}
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l
9/15/75	<.01	<.1	<.001	<.001	<.01	.45	<.001	<.0004	.2	<.01	<.1	.023	3.85	-
10/20/75	<.01	<.1	<.001	<.001	.01	.75	<.001	<.0004	.32	<.01	<.1	.040	2.92	-
12/29/75	-	-	-	-	-	-	-	-	-	<.01	-	.0978	10.3	-
1/15/76	-	-	-	-	-	-	-	-	-	<.01	-	.085	93.2	-
2/2/76	-	-	-	-	-	-	-	-	-	<.01	-	2.005	17.5	-
2/11/76	<.01	<.01	<.001	<.001	<.1	.73	<.001	<.0004	.4	<.01	<.001	.0672	13.5	0
6/2/76	-	-	-	-	-	-	-	-	-	<.01	-	.125	40.9	-
9/29/76	-	-	-	-	-	-	-	-	-	<.01	-	.266	65.5	-
11/3/76	-	-	-	-	-	-	-	-	-	<.01	-	.227	70.7	-
12/13/76	-	-	-	-	-	-	-	-	-	-	-	.330	102.0	-
1/4/77	-	-	-	-	-	-	-	-	-	-	-	.0403	6.8	-
2/7/77	-	-	-	-	-	-	-	-	-	-	-	.395	7.1	-
3/16/77	-	-	-	-	-	-	-	-	-	<.01	-	.278	65.5 MW-2	-
4/15/77	.02	.2	<.001	<.001	.6	.46	<.001	.0023	.5	<.01	<.01	.260	172.0 79.4	<1
5/16/77	<.01	.1	<.001	.005	<.1	.55	<.001	.0007	.7	.02	<.01	.531	117.0 9.9	<1
6/15/77	<.01	.1	.001	.001	.1	.91	<.001	.0004	.64	.01	<.01	.516	165.0 84	1
9/30/77	.01	-	-	-	-	-	-	-	-	.01	-	-	97.4 115	-
10/14/77	.01	-	-	-	-	-	-	-	-	.02	-	-	141±3 120	1
10/24/77	.01	-	-	-	-	-	-	-	-	.01	-	-	135±4 66.7	-
11/14/77	.01	-	-	-	-	-	-	-	-	.01	-	.580	182±4 156	-
12/7/77	.01	-	-	-	-	-	-	-	-	.01	-	.850	30.4±1.8 27.9	-
1/6/78	.01	-	-	-	-	-	-	-	-	.01	-	.287	2.13±.32 9.5	-

GROUND WATER STANDARDS REFERENCE 3-103 SECTION B

SAMPLE LOCATION	CHLORIDE	COPPER	IRON	MANGANESE	PHENOLS	SULFATE	TOTAL DISSOLVED SOILDS	ZINC	
(MW-2)	Cl	Cu	Fe	Mn		SO_4	TDS	Zn	PH
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	
4/15/77	7.9	.002	<.001	.001	<.001	219	548	<.01	8.3
5/16/77	252	.008	.002	.004	<.001	1431	2520	.026	8.09
6/15/77	8.3	<.001	.016	.002	<.001	191	522	.01	8.14
10/14/77	-	-	-	-	-	-	511	-	-
11/14/77	-	-	-	-	-	-	505	-	-
1/6/78	-	-	-	-	-	-	536	-	-

GROUND WATER STANDARDS REFERENCE 3-103 SECTION A

SAMPLE LOCATION	ARSENIC	BARIUM	CADMIUM	CHROMIUM	CYANIDE	FLUORIDE	LEAD	MERCURY	NITRATE	SELENIUM	SILVER	URANIUM	RADIUM	
(MW-2)	As	Ba	Cd	Cr	CN	F	Pb	Hg	NO_3/N	Se	Ag	U	Ra_{226}	Ra_{228}
DATE	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	PCi/l	PCi/l
4/15/77	.02	.1	<.001	<.001	.6	.45	<.001	.0004	.2	<.01	<.01	.211	79.4	<1
5/16/77	<.01	.1	<.001	.001	.1	.51	<.001	.0004	19.4	<.01	<.01	.049	9.9	7.2
6/15/77	<.01	<.1	<.001	.001	<.1	.94	<.001	.0004	.69	.01	<.01	.502	84	1.0
9/30/77	.01	-	-	-	-	-	-	-	-	.02	-	-	115	-
10/14/77	.01	-	-	-	-	-	-	-	-	.02	-	-	120	-
10/24/77	<.01	-	-	-	-	-	-	-	-	.01	-	-	66.7 ± 3.1	-
11/14/77	.01	-	-	-	-	-	-	-	-	.01	-	.650	156 ± 4	-
12/7/77	.01	-	-	-	-	-	-	-	-	.01	-	.825	27.9 ± 1.5	-
1/6/78	.02	-	-	-	-	-	-	-	-	.01	-	.891	7.49 ± .57	-

HEALTH ENVIRONMENT department

STATE OF NEW MEXICO

JERRY APODACA
GOVERNOR

GEORGE S. GOLDSTEIN, Ph.D.
SECRETARY FOR HEALTH & ENVIRONMENT

P. O. Box 968
Santa Fe, New Mexico 87503
(505) 827-5271
ENVIRONMENTAL IMPROVEMENT DIVISION
Water Pollution Control Section

Director's Office

See file for originals

June 16, 1978

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Paul A. Matthews, Vice President
Operations Division
Ranchers Exploration and Development Corp.
P. O. Box 6217
Albuquerque, New Mexico 87107

Dear Mr. Matthews:

The discharge plan (DP-20) for Ranchers Exploration and Development Corporation's Johnny M. Mine, located near San Mateo, New Mexico, is hereby approved. The approved discharge plan consists of the discharge plan submitted March 27, 1978, and the letters dated April 26, 1978, June 10, 1978, and June 16, 1978, submitted as supplements to the discharge plan.

The discharge plan was submitted pursuant to Section 3-106 of the Water Quality Control Commission regulations. It is approved pursuant to Section 3-109. Please note subsections 3-109.E and 3-109.F, which provide for possible future amendment of the plan. Please also be advised that the approval of this plan does not relieve you of liability should your operation result in actual pollution of surface or ground waters which may be actionable under other laws and/or regulations.

The monitoring and reporting shall be as specified in the discharge plan and supplemental letters. Prior approval must be obtained from the EID Water Pollution Control Section for any modification to the monitoring program.

Pursuant to subsection 3-109.G.4 this plan approval is for a period of five years. This approval will expire June 16, 1983, and you should submit an application for new approval in ample time before that date.

Sincerely,

for Thomas E. Baca, Director

TEB:BG:tpc

cc: William Bennett, EID District I Manager
Pat Donahoe, EID Radiation Protection Unit
Roger Kauffman, Chief Engineer, Ranchers Johnny M. Mine
P.O. Box 707
Grants, NM 87020
Ted Brough, EID District I, Milan, NM 87020

GROUND WATER STANDARDS REFERENCE 3-103 SECTION C

SAMPLE LOCATION	ALUMINUM	BORON	COBALT	MOLYBDENUM	NICKLE
(MW-1)	Al	B	Co	Mo	Ni
DATE	mg/l	mg/l	mg/l	mg/l	mg/l
9/15/75	-	17.?	-	<.001	.001
2/11/76	-	.12	-	.003	.01
4/15/77	<.1	<.1	<.01	.031	.01
5/16/77	<.1	<.1	<.01	.019	.01
6/15/77	<.1	<.1	<.01	.34	.01
9/30/77	-	-	-	.10	-
10/14/77	-	-	-	.10	-
10/24/77	-	-	-	.10	-
11/14/77	-	-	-	<.10	-
12/7/77	-	-	-	<.10	-
1/6/78	-	-	-	.10	-

RADIOCHEMICAL OTHER THAN RADIUM

SAMPLE LOCATION	VANADIUM	THORIUM	LEAD		
(MW-1)	Va	Th_{230}	Pb_{210}	GROSS (ALPHA)	GROSS (BETA)
DATE	mg/l	PCi/l	PCi/l	PCi/l	PCi/l
9/15/75	-	-	-	14 ± 7	-
10/20/75	-	-	-	13 ± 9	-
2/11/76	-	-	-	40.5	6.8
6/15/77	.02	-	-	1540 ± 40	-
9/30/77	.10	23.2 ± 2.6	96 ± 10	370 ± 30	260 ± 20
10/14/77	< .10	24.5 ± 0.1	< 3.3	192 ± 14	120 ± 6
10/24/77	< .10	7.26 ± 2.64	-	161 ± 23	172 ± 21
11/14/77	< .10	4.56 ± 1.24	0 ± 3.0	417 ± 33	544 ± 33
12/7/77	< .10	10.3 ± 2.3	14 ± 6	321 ± 34	194 ± 30
1/6/78	.10	-	7.2 ± 5.1	17 ± 11	68 ± 20

STATE OF NEW MEXICO
Environmental Improvement Agency
P. O. Box 2348
Santa Fe, NM 87503
(505) 827-5271

HEALTH and SOCIAL SERVICES department

June 22, 1977

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Paul A. Matthews
Vice President, Operations
Ranchers Exploration and Development Company
1776 Montano Road, NW, Box 6217
Albuquerque, NM 87107

Dear Mr. Matthews:

Pursuant to New Mexico Water Quality Control Commission regulations you are hereby notified that a discharge plan as defined in section 1-101.I. is required of Ranchers Exploration and Development Company for its Johnny M. Mine located near San Mateo, New Mexico. The discharge plan is to cover all discharges associated with the Johnny M. Mine which may move directly into ground water, including backfilling of mine stopes with tailings.

This notification of discharge plan requirement is pursuant to sections 3-104 and 3-106. Section 3-106 provides that in certain circumstances discharge without an approved discharge plan may be allowed for a limited period of time. I hereby allow that your discharge may proceed without an approved discharge plan until February 27, 1978. Your discharge plan must be approved by the agency on or before that date if the discharge is to continue thereafter.

~~Your approved discharge plan can be used to fulfill license condition 15 in your Radioactive Materials License NM-RED-MB-00, pursuant to the terms of that license. Any material submitted as part of your license requirement will, upon your request, be considered to be part of your discharge plan.~~

Sincerely,

Thomas E. Baca, Director

TEB:MSG:jm

cc: J. K. Deuel, Ranchers Exploration and Development
Dan Vigil, EIA Regional Manager

E.I.A.

WATER TREATMENT DATA

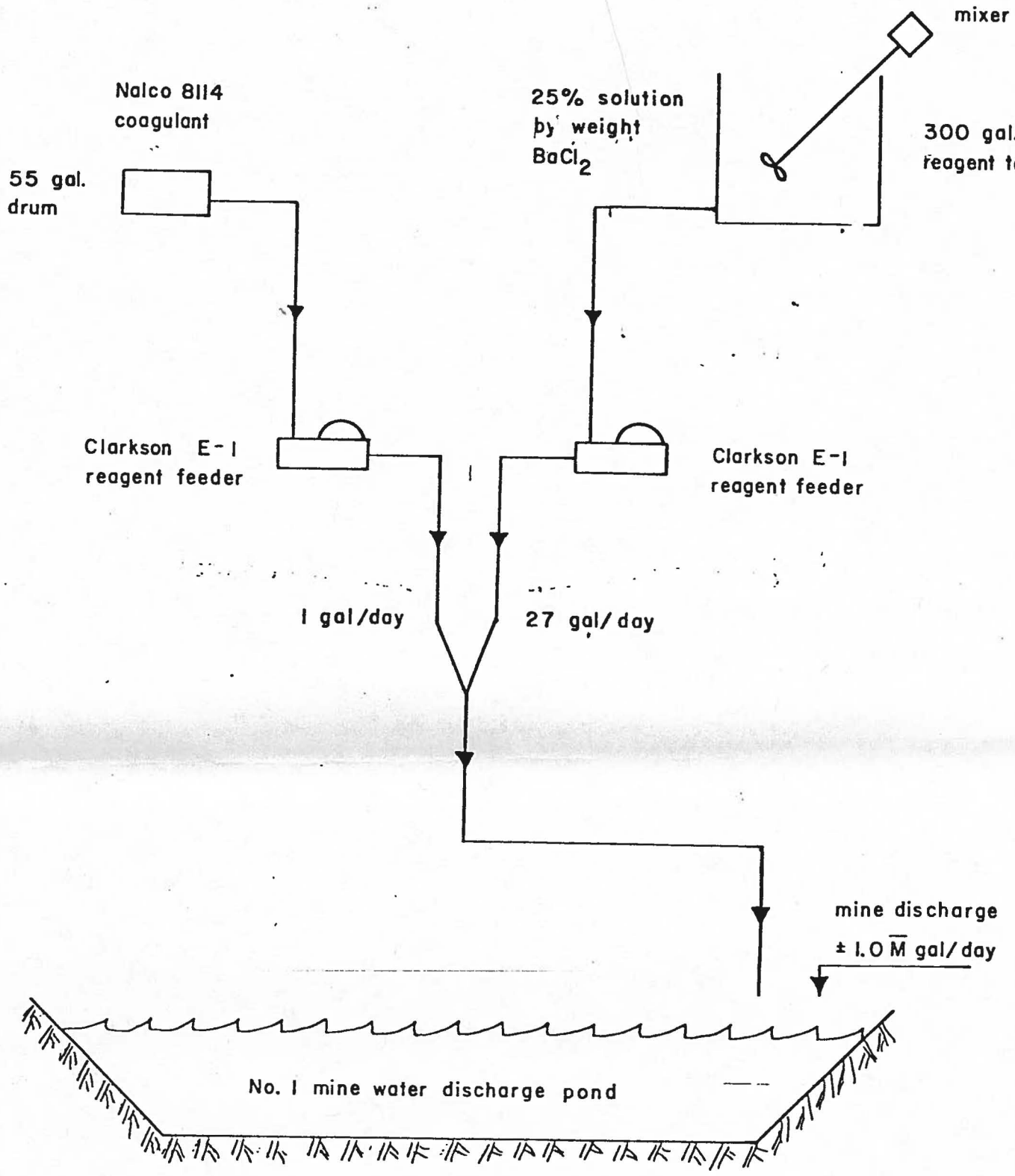
RANCHERS EXPLORATION AND DEVELOPMENT CORP.

Johnny M. Mine

RANCHERS EXPLORATION & DEVEL. CORP.

JOHNNY M. MINE

WATER TREATMENT FACILITY



DEC 21 1990

URFO:DLJ
Docket No. 40-8914
SUA-1482
04008914090E

MEMORANDUM FOR: William Brown, Regional Counsel
Region IV

THRU: A. Bill Beach, Director
Division of Radiation Safety and Safeguards
Region IV

FROM: Ramon E. Hall, Director
Uranium Recovery Field Office
Division of Radiation Safety and Safeguards
Region IV

SUBJECT: TERMINATION OF THE SOURCE MATERIAL LICENSE ISSUED TO HECLA MINING COMPANY FOR THE JOHNNY M MINE, SAN MATEO, NEW MEXICO

BACKGROUND

The Johnny M Mine located near San Mateo, New Mexico, was operated by Ranchers Exploration and Development (predecessor to Hecla) from early 1972 to late 1982. The mining sequence at the mine included backfilling of the mined-out areas with mill tailings returned to the site from the mill which processed the ore. To accomplish this, two surface injection locations were used for storage of the uranium tailings prior to disposal in the mine stopes. According to New Mexico records, these two areas covered approximately one acre at the north and one acre at the south injection site. The tailings were slurried and then pumped into the mine to prevent caving and "reduce the vulnerability of possible breaks in the integrity of the Dakota aquifer located above the mine." An estimated 286,000 tons of tailings were injected into the mine. Disposal depths ranged from 1134 feet to 1148 feet and from 1162 feet to 1183 feet below the surface (using the shaft for datum) or about 1100 to 1300 feet underground, depending on the terrain.

Reclamation of the mine property began in early 1982. The mine shaft was sealed with a four foot thick water ring reinforced concrete plug set between the Dakota and the Westwater members of the formation. The portal was sealed

URFO:PM
DLJacoby/db
12/18/90

URFO:DD
EFHawkins
12/21/90

URFO:D:RIV
for REHall
12/21/90

(1)

with a 12-inch thick reinforced concrete plug, and a 20-inch diameter capped steel pipe was set in the concrete. The surface was then covered with earthen materials during site recontouring. The location of the shaft is not presently obvious due to the revegatated surface.

DISCUSSION

By letter dated September 28, 1988, Hecla requested an amendment to their licence to incorporate their proposed reclamation plan. The reclamation for the site consists of cleanup of the remaining surface contaminatation to appropriate standards, and leaves the underground tailings undisturbed. The contaminated material will be transported to and disposed of at the Quivira Mining Company's Pond 2 disposal area. After several revisions to the proposed plan, NRC was in agreement with the proposed cleanup plan submitted May 4, 1990, and an amendment was issued on October 12, 1990.

By letter dated October 18, 1990, Hecla requested that NRC terminate their license after the cleanup (reclamation) of the surface is complete. We are requesting that you review the situation and indicate if NRC will be able to terminate the license upon successful completion of the surface cleanup.

Issues to Consider

1. The siting criteria discussed in 10 CFR 40, Appendix A, Criterion 1 is met by underground disposal. Criterion 3 sets the "prime option" for disposal of tailings below grade in mines.

2. The Appendix A Criteria 4 and 6 controlling the attenuation of radon releases and the erosion protection design would not be applicable at the site after cleanup is completed as there would be no tailings remaining on the surface to protect.

3. The risk to workers would clearly be greater than the benefit to the public health and safety if cleanup of the buried tailings were required. The exception to this could possibly be the issue of ground water. The milling process produces fine grain tailings which have a greater surface area than the former ore. This allows trace metals, residual radionuclides, as well as anions and cations to easily go into solution. If necessary, NRC may want to consider application of supplement standards similar to those applied at Title I sites. Hecla has indicated that no shallow ground water has been identified at the site. Piezometric depth to the primary aquifer is reportedly 800 feet. The distance between the tailings filled stopes and the overlying Dakota aquifer is reportedly 130 to 150 feet. The mine reportedly is separated from the aquifer by a confining bed of "bentonitic clays."

4. The land owner is reportedly reluctant to sell the land. Therefore, Hecla does not propose to turn the land over to the government. Criterion 11 may provide for this situation by including an exclusion to title: "In some rare cases, such as may occur with deep burial where no ongoing site

surveillance will be required, surface land ownership transfer requirement may be waived." If the surface is cleaned to release standards, no site surveillance would be necessary for the tailings disposed of in the underground mine as per Criterion 12.

5. The State of New Mexico authorized the mine backfill at the Johnny M Mine. Also, the license for a similar mine backfill site, UNC's North Church Rock Mine, had been terminated by the State prior to return of the program to NRC.

RECOMMENDATION

Hecla's request regarding determination of the requirements of license termination prior to initiating surface cleanup at the site is prudent for all parties involved. We recommend that Hecla's license be terminated upon verification by NRC that surface cleanup efforts have been successful. Termination of the license should not require transfer of land title to the State of New Mexico or a federal government agency and should not require a long term surveillance fee. This recommendation is based on the 5 items discussed above.

Original signed by
Edward F. Hawkins

for Ramon E. Hall, Director
Uranium Recovery Field Office
Division of Radiation Safety and
Safeguards
Region IV

cc:
PLohaus

bcc:

Docket File No. 40-8914
PDR/DCS
URFO r/f
ABBeach, RIV
LLO Branch, LLWM
DLJacoby
BGarcia, RCPD, NM
EMontoya, NMED
8914/090E/DLJ/90/12/13/M

WATER QUALITY DATA for Discharges From Uranium Mines and Mills in New Mexico

NM Health and Environment Department
Environmental Improvement Division
WATER POLLUTION CONTROL BUREAU
July 1980

WATER QUALITY DATA FOR DISCHARGES FROM

NEW MEXICO URANIUM MINES AND MILLS

Principal Investigation and Data Collection by:

Maxine S. Goad	Water Pollution Control Bureau, EID
Charles L. Nylander	Water Pollution Control Bureau, EID
Bruce M. Gallaher	Water Pollution Control Bureau, EID
John G. Dudley	Water Pollution Control Bureau, EID
Betty L. Perkins	Energy and Minerals Department

Text Preparation by:

Betty L. Perkins	Energy and Minerals Department
Maxine S. Goad	Water Pollution Control Bureau, EID

WATER POLLUTION CONTROL BUREAU
ENVIRONMENTAL IMPROVEMENT DIVISION
NEW MEXICO HEALTH AND ENVIRONMENT DEPARTMENT
Post Office Box 968
Santa Fe, New Mexico 87503

JULY 1980

Table XVIII

Ranchers - Johnny M Mine

	10/27/77 Discharge	11/17/78 Discharge	11/07/79 Discharge	11/07/79 Raw Mine Water
TSS mg/l	2.6	7.8	8.0	1088
TDS mg/l	520	511	574	753
cond μmhos	855	737	784	756
pH	8.35		7.94	7.85
As mg/l	.011	.0056	.017	.044
Ba mg/l	NA	.346	1.671	.212
Se mg/l	.008	.061	.043	.128
Mo mg/l	.24	.325	.390	.612
NH_3 mg/l	.115	.125	.03	.36
Na mg/l	101.2	101.2	101.2	101.2
Cl mg/l	8.8	10.2	14.1	8.53
SO_4 mg/l	213.7	204.5	183.7	188.5
Ca mg/l		55.2	55.8	51.6
K mg/l		3.9	3.51	3.90
bicarbonate mg/l		237.4	246.5	256.0
Cd mg/l		<.005	<.001	< .001
nitrate + nitrite mg/l		.56	.38	.36
Mg mg/l			11.5	15.6
V mg/l		.043	.027	1.408
Zn mg/l		<.100	<.250	< .250
Al mg/l			.645	17.8
Pb mg/l		<.005	<.005	.008
gross ∝ pCi/l		1500±100	700±50	1700±100
Ra-226 pCi/l	23.±1	200±10	3.0±.9	
Ra-228 pCi/l	0±2			
Pb-210 pCi/l	33±6			
U mg/l	.67	.76	2.25	5.09

raw mine water sample withdrawn at the inlet to the initial settling pond at the Section 35 mine. The temperature of this raw mine water was 20.3°C.

Prior to 1979 there was a pond associated with early sand-slime separations for backfill located near Section 35. The radiological data for this pond, sampled in 1978, is shown in Table XVII. During 1979 Kerr-McGee reclaimed the pond area; it appears that they have not only produced a gently contoured area, but also have reseeded the disturbed surface.

Ranchers Exploration and Development Company Johnny M Mine

Further to the east of Section 36 is the Johnny M mine of Ranchers Exploration and Development Corp. The host rock is the Poison Canyon Member of the Morrison Formation. Backfill using sands from Kerr-McGee's mill with a technique similar to that used at Kerr-McGee's Section 35 and Section 36 mines began in 1977. This mine is relatively young, and in 1977 when the first visit was made, treatment of the discharge was flocculant and batches of $BaCl_2$ addition as the water entered the first of the two unlined settling ponds. Since then a facility for the $BaCl_2$ addition has been built and 100 pounds per day or about 5.5 mg of $BaCl_2$ per liter of inflow water is added. In 1977 the discharge was 800 gpm; in 1978, 1000 gpm; and in 1979, 1500 gpm. Water temperature of the mine water outflow was 21°C. Any treated mine water not taken by the Lee Ranch for irrigation use is piped to a discharge ditch which drains into the Rio San Mateo.

raw mine water sample withdrawn at the inlet to the initial settling pond at the Section 35 mine. The temperature of this raw mine water was 20.3°C.

Prior to 1979 there was a pond associated with early sand-slime separations for backfill located near Section 35. The radiological data for this pond, sampled in 1978, is shown in Table XVII. During 1979 Kerr-McGee reclaimed the pond area; it appears that they have not only produced a gently contoured area, but also have reseeded the disturbed surface.

Ranchers Exploration and Development Company Johnny M Mine

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Table XVIII

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cond μmhos	855	737	784	756
pH	8.35		7.94	7.85
As mg/l	.011	.0056	.017	.044
Ba mg/l	NA	.346	1.671	.212
Se mg/l	.008	.061	.043	.128
Mo mg/l	.24	.325	.390	.612
NH_3 mg/l	.115	.125	.03	.36
Na mg/l	101.2	101.2	101.2	101.2
Cl mg/l	8.8	10.2	14.1	8.53
SO_4 mg/l	213.7	204.5	183.7	188.5
Ca mg/l		55.2	55.8	51.6
K mg/l		3.9	3.51	3.90
bicarbonate mg/l		237.4	246.5	256.0
Cd mg/l		<.005	<.001	< .001
nitrate + nitrite mg/l		.56	.38	.36
Mg mg/l			11.5	15.6
V mg/l		.043	.027	1.408
Zn mg/l		<.100	<.250	< .250
Al mg/l			.645	17.8
Pb mg/l		<.005	<.005	.008
gross ∝ pCi/l		1500±100	700±50	1700±100
Ra-226 pCi/l	23.±1	200±10	3.0±.9	
Ra-228 pCi/l	0±2			
Pb-210 pCi/l	33±6			
U mg/l	.67	.76	2.25	5.09

RANCHERS EXPLORATION AND DEVELOPMENT CORPORATION
Box 6217 / 1776 Montano Road, N.W. / Albuquerque, New Mexico 87197
Telephone (505) 344-3542 / TWX 910 989 1688 RANC EXPLO ABQ

January 14, 1982

New Mexico Environmental Improvement Division
P. O. Box 968
Santa Fe, NM 87503

ATTN: Tom Christiansen, Environmental Scientist
Randall T. Hicks, Water Resource Specialist

NOTICE OF INTENT TO CEASE OPERATIONS AND TO VACATE PREMISES

Pursuant to Section 4-460 of the EID Radiation Protection regulations, and pursuant to our approved water discharge plan, please be formally advised that Ranchers will soon cease mining at the Johnny M uranium mine. Our expected cessation date is mid-February 1982. We will have personnel on the property for some time after that for purposes of cleanup and salvage.

As we discussed at our meeting on December 4, 1981, this letter is intended to satisfy the requirements of both the radioactive materials and water discharge sections of the EID.

Our cleanup programs consists of the following planned actions which will commence as soon as mining ceases:

1. Remove and bury debris
   2 men, 3 weeks with loader & truck
   (120 hours)
2. Partially fill ponds with waste rock and solid wastes
   2 men, 4 weeks with loader & truck
   (160 hours)
3. Reclaim south bore hole area
   (60 hours grader)
   (48 hours #1)
4. Reconstruct water diversion main yard to old arroyo
   (40 hours)
5. Undercut toe of waste pile, contour waste, drift borrow from toe and berms over waste and pond areas
   (120 hours)

— what about dredging pond bottom?

HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO
ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 827-5271
RUSSELL F. RHOADES, M.P.H., DIRECTOR

RADIATION PROTECTION BUREAU

Bruce King
GOVERNOR

George S. Goldstein, Ph.D.
SECRETARY

Larry J. Gordon, M.S., M.P.H.
DEPUTY SECRETARY

M E M O R A N D U M

TO: File

FROM: Tom Christiansen

DATE: July 19, 1982

SUBJECT: Inspection visit to Ranchers Johnny M. Mine

Tom Christiansen and Ted Brough visited the Johnny M. mine site on July 15, 1982 to observe the reclamation progress. Jim Rosel and Roger Kauffman met us and showed us around the site.

Though not EID responsibility it was noted that the ore pads had been scraped and covered with fresh earth and graded. Measurements in those areas are low with one hot spot near the entrance into the fenced area. That area should be easy to take care of when the entrance roadway is removed and graded.

The mine waste is being graded into the ponds and the entire area is being contoured. The south bore hole sand storage area has been worked and only has a few hot spots left! They were easily identified by the grey colored soil. Those spots will be covered and the area will be graded to protect against erosion.

The north bore hole has only received a little attention and requires extensive scraping and covering. However, the readings at this area are only slightly above limits.

The main problem at the site is all of the mining equipment that Ranchers has been unable to sell. However, this will not affect the EID reclamation program and the site should be completed within several weeks.

Another visit will be made in several weeks to determine progress in the final stages of cleanup.

TC/mp

TONEY ANAYA
GOVERNOR

DENISE D. FOR
DIRECTOR

HEALTH ENVIRONMENT department

STATE OF NEW MEXICO
ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 984-0020

April 2, 1985

Ms. Colleen Kelley
Environmental Supervisor
Hecla Mining Company
P.O. Box 320
Wallace, Idaho 83873

Dear Ms. Kelley:

As indicated to you in our phone conversation of March 29, 1985, Radioactive Material License NM-RED-MB-15 is extended in the license amendment attached to this correspondence for an indefinite period of time pending accomplishment and resolution of the previously agreed upon reclamation objectives. As I indicated to you in our conversation, a survey has been conducted by our Surveillance and Assessment Section (SAS) at the mine backfilling sites (designated as North Bore Hole Area and South Bore Hole Area). This survey shows that efforts to date by Ranchers Exploration and Development Company have been unsuccessful in isolation of the original backfill materials and in revegetation of the site.

External exposure rate data presented in the Johnny M. Mine Termination report showed no significant change in mean μR/h levels through three separate phases of reclamation at the North Vent Hole. The mean level was 158 μR/h following the initial step by Ranchers when "all backfill material and debris were removed from the areas by loading and scraping." This level greatly exceeded the agreed upon target of 25 μR/h in accordance with the ALARA principle. At the South Vent Hole, there was a significant increase in mean external exposure levels from the initial (47 μR/h) to final cleanup (183 μR/h).

Attachments 1 and 2 show the location of soil sampling sites and radionuclide concentrations in eight soil samples collected by the SAS. Samples obtained from post reclaimed areas (#5, 8), showed relatively high concentrations of radionuclides, but were depleted in U-238 and U-234. Sample #2 obtained from the perimeter of the licensed area also showed relatively high concentrations of nuclides of the uranium decay chain, but was also depleted of uranium. All three samples clearly show the presence of exposed backfill materials. However, samples from background materials, reportedly used for cover materials (#1, 3, 6 and 7), showed concentrations from 1-3 pCi/g for all radionuclides. Sample #4 from a nearby sandstone formation also had relatively low concentrations of radionuclides (4-5 pCi/g). Attachment 3, showing a gamma spectrum from samples #1 and #2, demonstrates the

differences in the levels of activity and the depleted uranium in sample #2 for peaks at 320 kev and 460 kev, when compared to a standard pitchblend sample which has all U-238 decay chain nuclides in secular equilibrium.

Since the reported cover materials are very low in radionuclide concentrations, and backfill materials have been found at the surface of both licensed areas, it must be assumed that the original backfill materials were not adequately removed or isolated.

As I further indicated to you in our phone conversation, the Division will be glad to meet with you at your convenience to determine how we can best resolve the apparent discrepancies at these sites. Please feel free to contact me should you have further questions.

Respectfully,

Kenneth M. Hargis for

Felix R. Miera, Jr.
Program Manager
Uranium Licensing Section

FRM/cvg

cc: Richard Young, Legal Services Bureau
Andrea Smith, Legal Services Bureau
Ken Hargis, Chief, Radiation Protection Bureau
Jere Millard, Radiation Protection Bureau

HEALTH & ENVIRONMENT department

STATE OF NEW MEXICO
ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 827-5271
Thomas E. Baca, M.P.H., Director

Bruce King
GOVERNOR

George S. Goldstein, Ph.D.
SECRETARY

Larry J. Gordon, M.S., M.P.H.
DEPUTY SECRETARY

May 4, 1982

Iona Lee
Lee Ranch
Fernandez & Co.
San Mateo, NM 87050

Dear Mrs. Lee:

I am sure that you are aware that Ranchers Exploration and Development Corporation's Johnny M Mine will be completing their restoration of their site in the middle of May, 1982. The Environmental Improvement Division and Ranchers have worked out an agreement for the post-operational monitoring of the ground water at the site. The State is interested in monitoring the ground water because the Johnny M Mine has employed the practice of "mine stope backfilling" with uranium mill tailings. This means that there is a substantial amount of uranium mill tailings deposited in the mined-out portions of the property. The State is interested in studying the effects of this practice on the water quality of the 1500 foot level.

In order to do that we need your help. Ranchers has indicated that part of the mine site is on your property. Four times a year we would like to visit the site and take water samples from the 1500 foot level. Ranchers has constructed a monitor well for this purpose. Of course, we will abide by any of your rules for the oportunity of visiting the site. I will be in the Grants area in mid May and would be happy to talk with you about the State's proposed monitoring program. I will try to contact you prior to my Grants visit.

Please contact me at the above address and telephone number Ext. 286 if you have any questions.

Sincerely,

Randy Hicks

Randy Hicks
Water Resource Specialist
Ground Water Section

RH:md

cc: Albuquerque EID District Office
Jim Rosel, Ranchers
Tom Christensen

M 82

HEALTH ENVIRONMENT department

STATE OF NEW MEXICO

ENVIRONMENTAL IMPROVEMENT DIVISION
P.O. Box 968, Santa Fe, New Mexico 87504-0968
(505) 984-0020

TONEY ANAYA
GOVERNOR

DENISE D. FORT
DIRECTOR

October 2, 1985

Colleen D. Kelley
Environmental Supervisor
HELLA MINING COMPANY
P.O. Box 320
Wallace, Idaho 83873

Dear Ms. Kelley:

Enclosed are results of the metal analysis from the Johnny M. mine water which we sampled on June 19th. The only WQCC standard that is exceeded is for Manganese. The standards for Cd, Cr, Pb, and As are below detection limits for ICP analysis. In general the mine water looks pretty good.

Should you have any questions, please contact me at the above address and telephone number (ext. 285).

Sincerely,

Steve Sares

Steven Sares
Water Resource Specialist
Ground Water/Hazardous Waste Bureau

SS:dlr

Enclosures

SAMPLE RESULTS IN UIC 55 file
SWS

UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
URANIUM RECOVERY FIELD OFFICE
BOX 25325
DENVER, COLORADO 80225

Ground Water
(attn: David Trujillo)

MAY 24 1993

Docket No. 40-8914
SUA-1482, Amendment No. 4
04008914090E
X60611

Hecla Mining Company
ATTN: Larry A. Drew, Manager
Environmental Affairs
6500 Mineral Drive
Box C-8000
Coeur d'Alene, Idaho 83814-1931

Dear Mr. Drew:

We are in receipt of your letter dated October 18, 1990, requesting termination of your Source Material License SUA-1482 for the Johnny M Mine, McKinley County, New Mexico. Based upon NRC's assessment of your Environmental Report and verification that surface reclamation efforts had been successful, it was determined that the proper action was to issue a finding of no significant impact in the Federal Register. A final finding of no significant impact was published in the Federal Register (58 FR 29641) on May 21, 1993.

Therefore, pursuant to 10 CFR Part 40, Source Material License SUA-1482 is terminated by deleting License Condition Nos. 6 through 11 and modifying License Condition No. 4 to read as follows:

4. Terminated

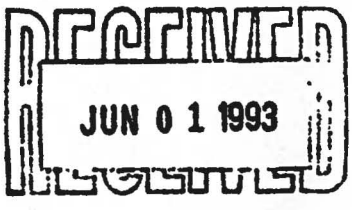
The license is being reissued to reflect this change. This licensing action was discussed between you and Dawn L. Jacoby on May 24, 1993. If you have any questions or comments regarding this action, please notify her at (303) 231-5815.

Sincerely,

Ramon E. Hall
Director

Enclosure:
Source Material License SUA-1482

cc:
B. Garcia, RCPD, NM
E. Montoya, NMED



Hecla Mining Company

April 18, 1985

Certified Mail--Return Receipt Requested

Mr. Felix R. Miera, Jr.
Program Manager
Uranium Licensing Section
State of New Mexico
Environmental Improvement Division
PO Box 968
Santa Fe, New Mexico 87504-0968

Dear Mr. Miera:

In response to your letter of April 2, 1985, Hecla Mining Company successor to Ranchers Exploration and Development Corporation's interests in the Johnny M mine is in strong disagreement to an unconditioned indefinite extension of Radioactive Materials License NM-RED-MB-15. Since Hecla Mining Company is unfamiliar with the history of the site, we wish to review the files and examine the site. We then wish to meet with the Division to come to an understanding on final termination for this license. Upon completion of our review, we will contact the Division to arrange a meeting.

Sincerely,

Michael B. White

Michael B. White
Counsel and Assistant Secretary

MBW/js

Mayerson, David, NMENV

From: LucasKamat, Susan, EMNRD
Sent: Monday, August 16, 2010 08:39
To: Mayerson, David, NMENV
Cc: Pfeil, John, EMNRD; Bahar, Dana, NMENV
Subject: RE: Section 32 mine - MARP Prior Rec files
Attachments: Bucky_mine_PCS_07152010_SALK.doc; Chill_Willis_PCS_07012010_SALK.doc; Dysart_1_PCS07012010_SALK.doc; Dysart_2_SALK.doc; Hogan_mine_PCS_07062010_SALK.doc; John_Bull_05202010_SALK.doc; Johnny_M_06022010_SALK.doc; Section_32_mine_PCS_07202010_SALK_edits.doc

David:
Here are the site screen with MMD's comments.

From: Mayerson, David, NMENV
Sent: Mon 8/16/2010 7:34 AM
To: LucasKamat, Susan, EMNRD
Cc: Pfeil, John, EMNRD; Bahar, Dana, NMENV
Subject: RE: Section 32 mine - MARP Prior Rec files

Thanks for this information, Susan. As you noted, I didn't have much else to go on.

Will you be able to get me comments/corrections on the rest of the PCSs today? I have to get these completed this week as I am leaving on vacation after Thursday. Thanks.

David L. Mayerson
New Mexico Environment Department
Ground Water Quality Bureau
Superfund Oversight Section
1190 St. Francis Drive, Suite N2312
Santa Fe, NM 87505

Telephone: (505) 476-3777
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From: LucasKamat, Susan, EMNRD
Sent: Friday, August 13, 2010 14:06
To: Mayerson, David, NMENV
Cc: Pfeil, John, EMNRD
Subject: Section 32 mine - MARP Prior Rec files

Here are some site reports for the Section 32 that are after the Anderson (1980) report.

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Site ownership and Potential Responsible Parties
After discovery of the ore body in 1968, Harrison Western Corporation sunk a shaft between 1972 and 1973. The mine was operated by Kop-Ran Development Corporation and Ranchers Exploration and Development between 1976 through 1982. Hecla Mining Company was the successor to Rancher's interests in the Site prior to April 2, 1985 (Ref. 16). The last recorded Site operator was Newmont Mining Company.

Comment [SALK2]: Newmont was never an operator. Newmont is the successor of the mineral rights since the Santa Fe Railroad sold all their mineral rights in the area to Newmont.

The mineral rights were held by the Santa Fe Railroad in 1982 (Ref. 17). The surface is currently owned by Fernandez Company Limited and Floyd Lee Ranch. According to Mr. Lee, new mining claims have been staked on the Site in recent years.

File review:
Files that were reviewed for this assessment are listed below.

Site reconnaissance:
Personnel from NMED and the New Mexico Energy, Minerals, and Natural Resources Department conducted a Site reconnaissance on July 26, 2010; Mr. Harry Lee accompanied state personnel to the head of valley in which the Site is located. All gamma readings shown on the figure accompanying this report were made with a Ludlum 14-C analog scintillometer (serial number 194209) with an uncollimated Ludlum 44-2 gamma detector (serial number PR241278), for which readings are recorded in counts per minute ("cpm"). Contact readings from this instrument ranged from 2800 cpm on the access road at the head of the valley above the minesite, to 260,000 cpm on the graded area near the mouth of valley. The ground surface at the Site was very wet from heavy rainfall that had occurred during days prior to the Site reconnaissance, and additional rain occurred sporadically throughout the Site visit. According to a representative from Ludlum, such environmental conditions could cause readings from the instrument to be higher than would otherwise occur under dry conditions. Additional elevation of readings also may occur due to radioactivity "shine" caused by topographic conditions or nearby radioactive sources. As further evidence of these potential effects upon the data herein reported, a grab sample of soil from Geographic Positioning Station ("GPS") 14, shown on the accompanying figure, was collected in a ziplock bag, allowed to desiccate for a day, and then another scintillometer reading was taken of the sample. The reading in the field at the location of this sample was 120,000 cpm; the reading from the sample was 12,000 cpm.

During the Site reconnaissance, State personnel also viewed the location of a nearby incomplete mine shaft that originally had been sunk by the Kerr-McGee Corporation on the Floyd Lee Ranch; this shaft has been converted into a water well.

According to Mr. Lee, all possible accesses to ground water in the vicinity of the Site and including those on the Site have been sampled recently by Strathmore Minerals Corporation as part of their baseline data collection for the proposed Roca Honda mine.

Recommendation:
Additional investigation of the Site is recommended to determine if any impacts or conditions exist that would pose threats to human health and the environment, especially the presence of unexploded blasting caps. NMED recommends performance of a radiological Site survey